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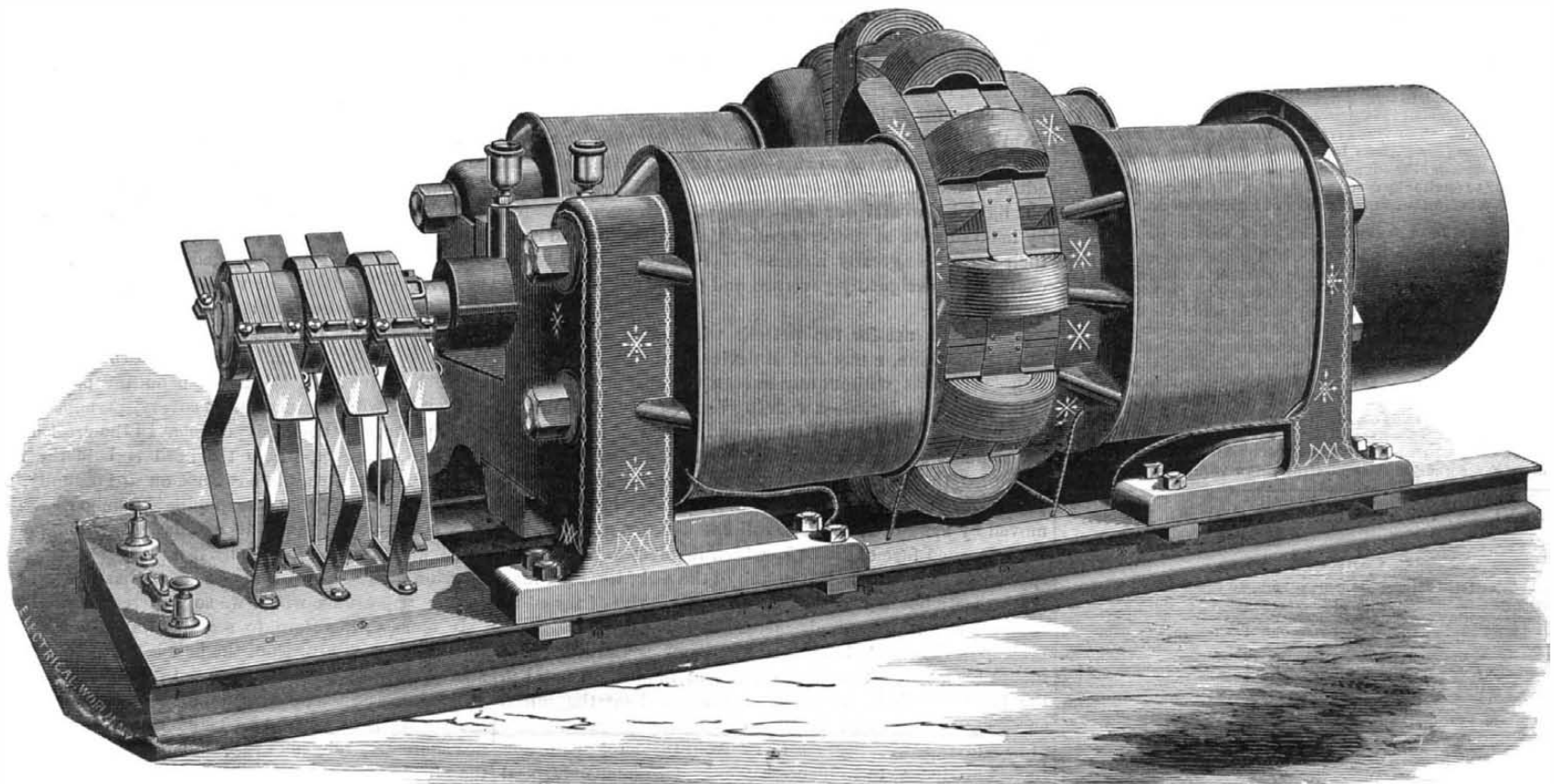
(*Continued on page* 277.)



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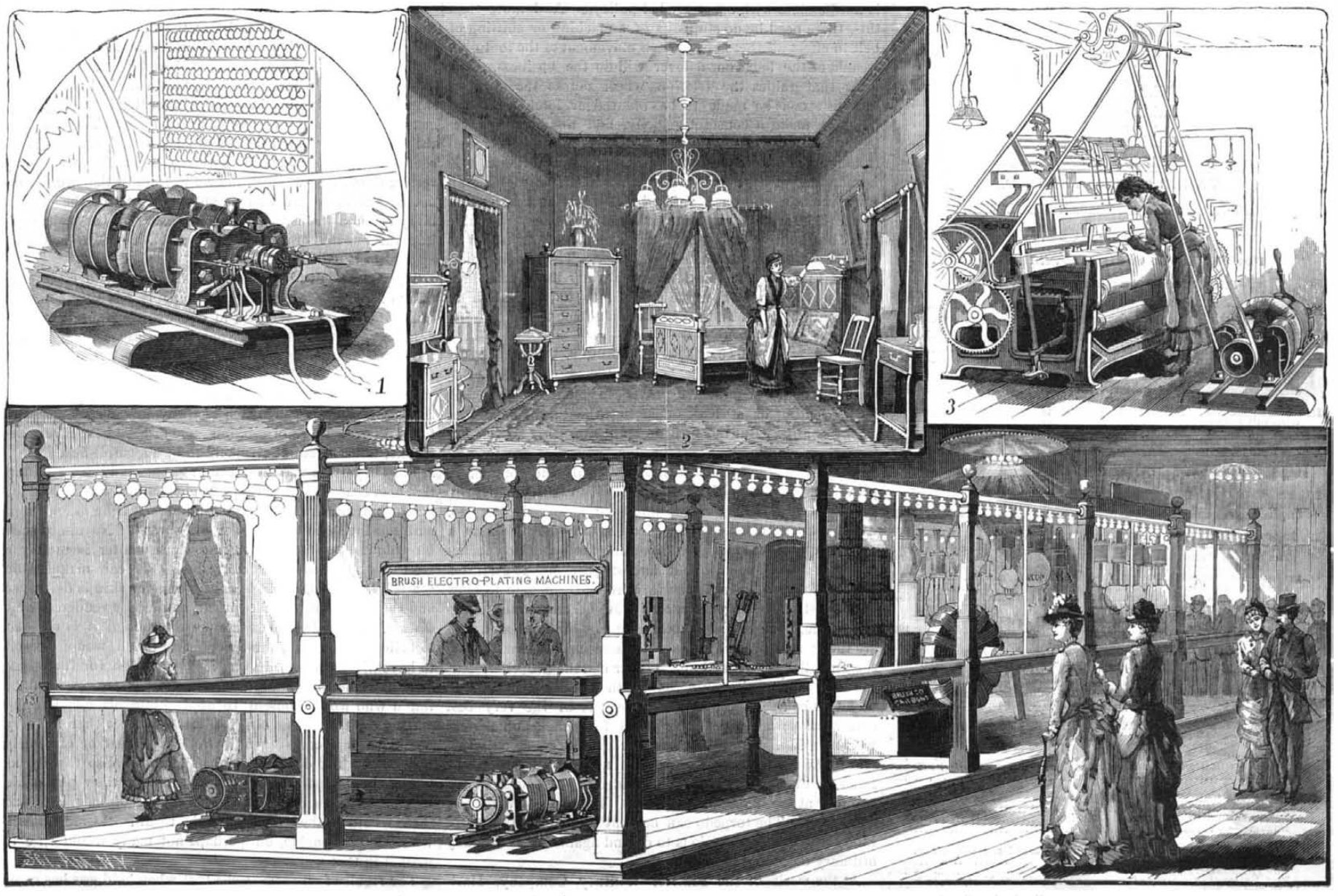

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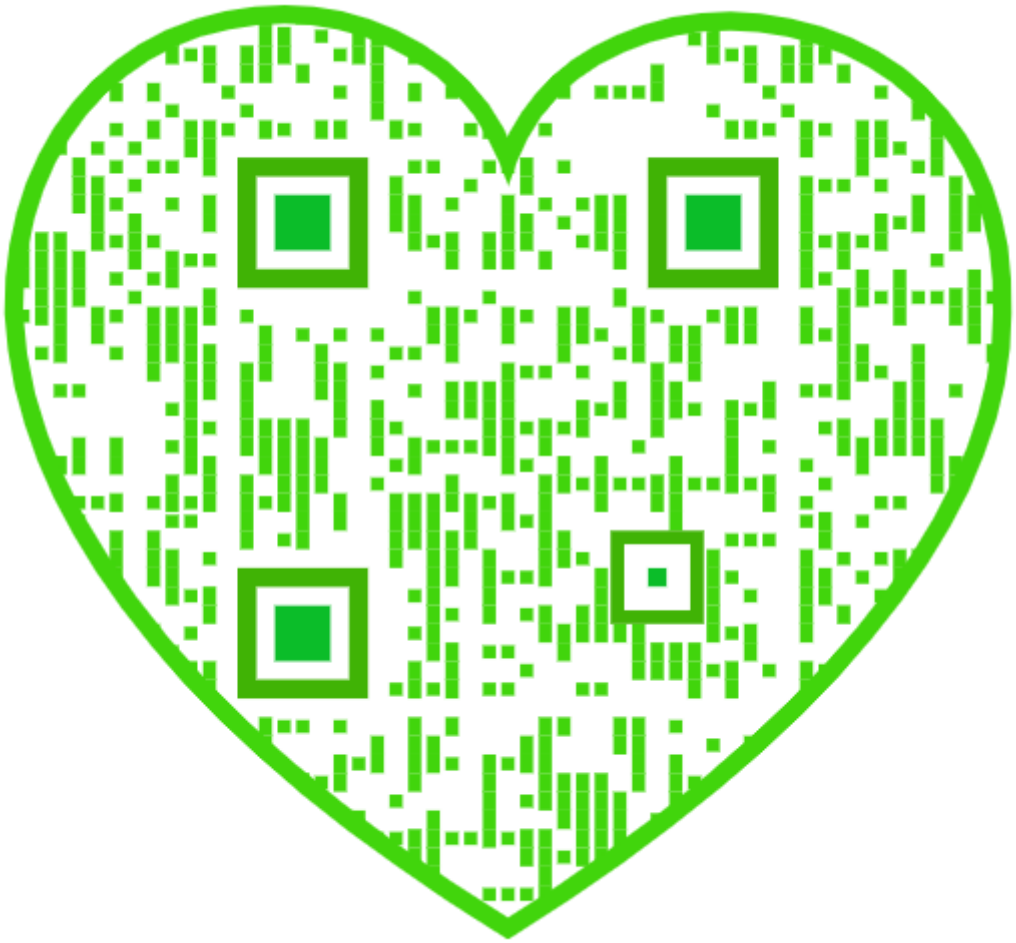

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CHANGEABLE SPEEDS.

It is beyond question that our present method of changes of speed of lathes, drills, milling machines, planers, and other tools where changes of speeds are required is a crude one, and unworthy of present mechanical capability. At the best, our changes are made by moving the belt from a large driving pulley to a smaller driven pulley, or from a small driving pulley to a larger driven pulley. But each of these changes involves a positive and unalterable degree of change of speed. It must be "Hobbs or nothing." A graded pulley may range thus in diameters: 6 inches, 8 inches, 10 inches, 12 inches. Suppose the spindle speed is 200 revolutions per minute, the small delivering pulley would give 300 feet per minute, the next 400 feet, the next 500 feet, and the last 600 feet. Between these changes of 100 feet per minute there are no intermediate speeds. It must be a change of 100 feet per minute. This is a favorable estimate of the changes of graded pulleys; it is seldom the grades are so near or that they range in the proportion stated—6 inches to 12 inches. Generally the total range of change of speed is much below these two proportionate extremes.

Now there is no theoretical reason, and no mechanical impediment, or hinderance, to such an arrangement of changeable speeds, for at least some of our machine tools, as shall greatly increase their usefulness. But our machine tool builders appear to run in ruts—shop ruts—and are slow to adopt a new thing and slow to adapt an old thing. Some of our light lathes and our light upright drills, which are fed by hand so as to be properly called "sensitive," would have their usefulness greatly increased if the speed could be as exactly and designedly governed and regulated as the feed can be.

There is in use for the potter's wheel, and also for the sewing machine, a mechanical device that will give a long range of speeds without any sudden and abrupt changes.

It is a simple device—a rotating disk twenty-four, thirty-six inches or larger in diameter, and across it from center to periphery extends a shaft feathered (with fixed key) the entire length. On this shaft traverses a sliding roll or small pulley controlled by a forked guide attached to a lever moved by hand or foot. The roll has a bearing by spring on the turned face of the disk, which revolves at a constant speed. If the roll is near the hub of the disk, its speed may not be fast; but if it is guided too near the rim of the disk, its speed is correspondingly increased.

Suppose the disk to be 36 inches in diameter, and allow four inches for a hub. The driven wheel at the nearest point to the hub—say six inches—will have a speed (at the initial speed of 200 revolutions per minute) of 300 feet per minute. If the driven wheel comes away from the hub, or the six inches around it, to 16 inches beyond, it will have a speed of 800 feet per minute. But better than these extreme changes is the fact that *any* speed, from the initial 300 feet to the extreme 800 feet, can be had and be maintained. This is not possible with exact graded pulleys. And more than this, there need be no stoppage of a machine or shifting of belt to effect all these changes; a movement of the foot on a treadle or the hand on a lever will do the business. The lever that guides the friction wheel across the face of the disk can be made to be secured or latched at any point to make a constant velocity, and the degree of velocity between the slowest and the fastest may be controlled exactly. The position of the driving disk and its shaft is immaterial. I have seen it on a horizontal shaft driving an upright shaft, and on a vertical shaft driving a horizontal shaft. The friction roll may be made of disks of raw hide or of leather, or be of hard rubber—the latter not to be used in oil, but is unaffected by water. There is no question of the utility of this device as already used, and there seems to be no insuperable obstacle to its adaptation to small upright drills and other small machine tools.

AUTOMATIC TORPEDOES.

During a war, where it is waged partly on navigable waters, fixed torpedoes have proved, in some cases, effectual in preventing or at least delaying the approach of an enemy's ships. But the torpedo branch of naval service has long ago extended to the offensive, and there is no machinery in existence that has more certainly and abundantly proved the resources of the machinist than that which is employed in the working of the offensive automatic torpedo. As an illustration take the Lay-Haight torpedo. This is a cigar-shaped vessel thirty feet long and perhaps thirty inches diameter in its central and largest portion. It carries a charge of an explosive in its forward end sufficient to blow the largest and strongest ironclad that ever floated to "kingdom come." In the after compartment and all amidship are the generator, the engine, the steering apparatus, and the propeller shaft, and at the outer end the propeller. Adjustable rudders determine its depth under the water and direct its course. All the machinery is of the very best construction; no expense is spared for exact and perfect workmanship. From the shore, or from an anchored ship, one of these destroyers can be sent a mile, one and a half miles, or even two miles, being guided in its course by the operator at the fixed starting point, by means of wires and electricity. The torpedo can be sent at a speed that absolutely prevents preparations to defend against it, even if any ordinary defense was possible.

At the works of the Pratt & Whitney Company, Hartford, Conn., there is now being built, under the direction of Mr. George E. Haight, one of his torpedoes that is to be submitted to a foreign government for approval before the award of a contract for a number of these naval weapons. This one is being made of sheet copper instead of sheet steel, the material of which most of the Lay-Haight torpedoes has heretofore been made. The engines which are to drive the propeller are six in number, or rather the engine is a group of six cylinders working synchronously with a speed that will develop about 1,000 revolutions of the screw propeller per minute. It is calculated and confidently believed that the speed of this torpedo will be almost if not quite at the rate of twenty miles per hour at a depth below the surface or from thirty inches to forty-eight inches. A distance of two miles will be traversed in six minutes, giving little opportunity for the crew of a hostile vessel to take defensive measures, even if they could detect its starting and determine its approach. The motive power of the engines is carbonic acid gas.

BALDNESS.—ITS PREVENTION AND CURE.

The mode of formation and growth of the hair is now so well known that there can be no question as to the cause of baldness. It is produced by a failure of normal nutrition in the papillæ at the base of each hair follicle. Imperfect work being done in the capillaries, which are here richly distributed, the cells which constitute a hair shaft are not formed in their due proportion, the old shaft thus feebly sustained becomes loose and drops away, leaving nothing in its place. This failure of nutrition may have a sudden cause, of which the effect will be but temporary. For instance, an attack of typhoid fever often leaves the papillæ of the scalp so much enfeebled that rapid baldness ensues. The papillæ, however, still retain their vitality, and as the system regains its strength they quickly recover their potentiality, and the hair comes again, perhaps thicker than before.

In the same manner certain cutaneous affections may cause the hair to fall by an action on the papillæ which is but temporary; in such cases recovery, perhaps with assistance, perhaps without it, is possible. In the great majority of instances, however, where the head is bald the failure of nutrition of each papilla has come on so gradually, and has continued so long, that the papilla no longer exists; it has passed away by atrophy; its capillaries have become obliterated, and even the follicle itself no longer constitutes a depression in the cutis, and the scalp has the smooth and shining appearance which we so well recognize.

It is easy, therefore, to see that in such a condition as this no renewed growth of the hair is to be expected, for the anatomical structure which caused its development and continued it has ceased to exist, and the countless remedies which are so freely advertised as being able to rejuvenate bald heads are utterly of no avail. They serve only to illustrate the greed and the impudence of the inventors, as well as the credulity of the purchasers. But such is the desire to escape the appearance of "growing old" that no doubt they will hold their ground for all time to come.

But now arises the question, Cannot the application of the various agents to the scalp, at the time when the hair is *beginning* to lose its hold, be of service in stimulating the follicles and papillæ into renewed and permanent vigor? To this question it is not possible, on theoretical grounds, to say no, absolutely; but in practical fact that is the only true answer to give in the vast majority of cases. The cause of the falling of the hair has been already stated, and safe reasoning tells us that our only hope can be in that which can restore the failing vitality, and we well know that we should not expect to secure this on any other part of the skin by filthy oils and washes. Proper cleansing of the scalp is as important as it is of all other parts; nothing else should be applied to it but common sense.

There can be little question that the continued close covering of the head with hats and caps is one very constant cause of baldness. Women, in our own communities, seldom lose their hair, except from sudden causes; and among those nations where the head is habitually left bare or but slightly covered, baldness is practically unknown. At the same time the beard, which is of the same class of hair as that of the scalp, but which is always uncovered, does not fail with age. A reform in our style of head gear is very desirable, but it is not at all likely to be accomplished.

The suggestion was some time ago made in our columns that bald heads might perhaps be covered anew with hair by "skin grafting," *i. e.*, applying bits taken from other scalps and causing them to take root and spread. No doubt such bits might be attached, but the whole matter is merely a wild fancy without practical value. We can make "skin grafts" take hold, but it is only where the skin is destroyed and the surface raw and exposed, commonly rendered so by disease. Assuming that some person (though it is difficult to believe that such a person could be found) would consent to have his scalp peeled away in preparation for the operation, and then assuming that some other person could be found who would consent to appropriate his own scalp to cutting out the proper bits for the work, yet then the very best possible success (even theoretically) must be extremely imperfect. The denuded surface would heal so rapidly between the "grafts" that no extension on their part could take place, and a head with small specks of hair here and there would be the only attainable result. "Crazy patchwork" is fashionable, but perhaps not many would care to wear it in that way.

The result of all seems to be that when baldness has come slowly and naturally, it has come to stay, and our only wisdom is to be content.

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UPSETTING OF IRON.

The quality of movement of the particles of iron under pressure or percussion is a remarkable one, whether the change in arrangement is made while the iron is hot or when it is cold. Red hot iron can be pressed to fill a mould as clearly and exactly as so much wax could be, and the grain of the iron will certainly follow all the contour of the mould. Thus the heads of pick-axes and articles of a similar form can be shaped by pressure, the metal that is removed to make the hole for the helve being forced to form the projection of the adze-like head.

Cold iron can also be moulded into form by pressure, a method largely practiced to finish drop forged iron articles. The heading machine for making rivets, bolts, and wood screw blanks shows some surprising results in the compression of iron; a No. 6 one inch screw requires a piece of wire slightly more than one and a half inches long to form it. Yet the total length of the screw blank, headed, is just one inch. Of this the countersunk shaped head is one-eighth of an inch by five-sixteenths of an inch widest—or top—diameter. Now, it has been proved by experiments with shorter bits of wire, that less than five-sixteenths of an inch of the extra eight-sixteenths is required to form the screw head. What becomes of the remaining more than three-sixteenths of an inch in length of the original one and a half inches that makes the one inch screw blank? There can be but one answer—the iron is driven upon itself; in other words, three sixteenths of an inch of wire is compressed into seven-eighths of an inch (measuring under the head), so that one inch and one-sixteenth of wire is compressed into seven-eighths of an inch in length, without increasing the diameter of the wire.

ASPECTS OF THE PLANETS IN NOVEMBER.

NEPTUNE

is morning star until the 13th, when he becomes evening star. He wins a distinguished place among the shining brotherhood during the month, for he reaches the point in his career of the greatest importance to observers on this planet. If telescopes improve in power, and practiced eyes improve in ability to discern, this is the portion of his course when, in the future, there will be a possibility of making discoveries on his distant disk. It may be only a belt, it may be only an additional satellite, for little more can be anticipated from the observation of an object that when nearest is more than 2,600,000,000 miles distant. But every line discerned on the face of this far away planet is a triumph of human skill.

The great event in Neptune's career is his opposition with the sun. It takes place on the 13th, at 3 o'clock in the afternoon. He is then at his nearest point to the earth, and is seen in opposition, or opposite to the sun, rising in the east as the sun sets in the west, and passing from the sun's western side, where he has played the part of morning star, to the sun's eastern side, where he will play the part of evening star. The earth is then between him and the sun, so that a straight line drawn from the sun through the earth would, if produced, reach Neptune. The same conditions prevail at the opposition of every superior or outer planet, and with a little study one can easily keep the run of our outside planetary neighbors.

The four epochs in the revolution of the superior planets are opposition, quadrature on the eastern side of the sun, conjunction, and quadrature on the sun's western side. These epochs are partially illustrated during the month, as observers can prove for themselves. Neptune is in opposition, Saturn is approaching opposition, Jupiter is in quadrature, Uranus is approaching quadrature, and Mars is approaching conjunction. A bird's eye view of the solar family—if such a thing were possible—on the 13th would show the earth and Neptune in line with the sun, Saturn nearing the same goal, and Jupiter nearly half way advanced toward the same point.

Neptune is now in fine position for telescopic observation. He is in the constellation Taurus, about 7° southwest of the Pleiades, and is visible during the whole night. A telescope with an aperture of three inches will bring him out in favorable weather. But it takes a more powerful telescope to reveal his solitary satellite, a tiny point of light close to the primary.

There are many things to interest observers concerning this distant planet, ranking next in size to Jupiter and Saturn. If we could approach nearer to him, doubtless we should behold a grand spectacle, solve some of the mysteries revealed in his peculiar spectrum, comprehend more clearly the laws that regulate the apparently retrograde motion of his one moon, and, most to be desired of all, find out if planets hitherto unknown lie hidden in the remoter regions of space. It is not improbable that increased optical power will reveal some of these secrets from our present standpoint, especially when it is remembered that the existence of Neptune as an acknowledged member of the solar family dates from 1846—only 38 years ago.

The right ascension of Neptune on the 1st is 3 h. 21m.; his declination is 16° 35′ north; his diameter is 2·6″; and he is in the constellation Taurus.

Neptune rises on the 1st about half past 5 o'clock in the afternoon; he sets on the 30th about half past 5 o'clock in the morning.

JUPITER

is morning star, and passes an important epoch in his course. On the 26th, at 3 o'clock in the morning, he is in quadrature with the sun on his western side. He is then at the half way house between conjunction and opposition, 90° west of the sun, rises at midnight, and sets at noonday. With telescopes of small power and under ordinary conditions this superb planet presents the appearance of a large round disk. Higher magnifying power will show a slight flattening at the poles. But only the best telescopes in the hands of the best observers will bring out the magnificent belts with their changing tints and the spots that from time to time appear and disappear on his disk. Powerful telescopes when Jupiter is in quadrature will reveal the approach of the gibbous phase. For at common times he, as well as the other giant planets, appears like a round orb without phases, on account of the great distance. An observation of the Prince of Planets in gibbous phase is an astronomical feat difficult to accomplish. Sometimes there will be a slight shade on the limb farthest from the sun, and sometimes the observation is more satisfactory. It is recorded that in the clear atmosphere of Southern Australia the second and third satellites have been seen to emerge at a sensible distance from the limb of the planet, thus proving the reality of the gibbous phase.

Jupiter for six months to come will be in most favorable condition for observation, more so than he will be for several years. For his path now tends in a southerly direction; while the law is, the farther north the planet, the better is it situated for observation.

The right ascension of Jupiter on the 1st is 10 h. 18 m.; his declination is 11° 27′ north; his diameter is 33 2″; and he is in the constellation Leo.

Jupiter rises on the 1st at a few minutes before 1 o'clock in the morning; on the 30th he rises soon after 11 o'clock in the evening.

SATURN

is morning star. No incident enlivens his monotonous course. But he is superb to behold as he wends his quiet way over the celestial course, approaching with unswerving step the goal that has been reached by his more distant brother planet Neptune, shining with a serene light among his companion stars, and giving a foretaste of the phase he will present when a year hence he combines every condition from which the best views may be anticipated. In the telescope he is magnificent beyond description. We never behold him through the glass without wishing that for once we could see him pictured on the sky in these grand proportions, where every eye might behold the exhibition of surpassing grandeur and beauty.

The right ascension of Saturn on the 1st is 5 h. 32 m.; his declination is 21° 48′ north; his diameter is 18·8″; and he is in the constellation Taurus.

Saturn rises on the 1st about half past 7 o'clock in the evening; on the 30th he rises about half past 5 o'clock.

VENUS

is morning star, but no longer in the ascendant, for it is now her turn to hide her "diminished rays." She is getting every day nearer the sun, and increasing her distance from the earth, which those who wish can verify for themselves as they note the later time of her rising and the lessening brilliance of her disk. She is almost plunging southward in her swift course, reaching southern declination on the 3d, and recording nearly 11° south declination at the close of the month. Those who remember her glorious appearance as evening star high up in the north will perceive the contrast in her present phase. But she is lovely even in her fading luster, as, hanging low in the heavens, she is still the sun's bright harbinger.

The right ascension of Venus on the 1st is 11 h. 57 m.; her declination is 1° 48′ north; her diameter is 16·8″; and she is in the constellation Virgo.

Venus rises on the 1st at 3 o'clock in the morning; on the 30th she rises at 4 o'clock.

URANUS

is morning star. His path lies very near that of Venus at the beginning of the month. The two planets are in conjunction on the 4th at 6 o'clock in the morning, when Venus is 50′ north of Uranus.

The right ascension of Uranus on the 1st is 12 h. 4 m.; his declination is 0° 15′ north; his diameter is 3·6″; and he is in the constellation Virgo.

Uranus rises on the 1st at a quarter after 3 o'clock in the morning; on the 30th he rises at half past 1 o'clock.

MERCURY

is morning star until the 4th, when he takes his turn as evening star. He is in superior conjunction with the sun on the 4th at 3 o'clock in the afternoon. This means that he is in line with the earth and sun, beyond the sun, and that he passes from the sun's western to his eastern side. He is too near the sun to be visible, and is therefore of little account on terrestrial records.

The right ascension of Mercury on the 1st is 14 h. 28 m.; his declination is 14° 15′ south; his diameter is 4·6″; and he is in the constellation Libra.

Mercury rises on the 1st about half past 6 o'clock in the morning; on the 30th he sets about a quarter after 5 o'clock in the evening.

MARS

is evening star. He, too, is traveling south. Not long since every planet in the system was in north declination. At the end of the month Venus, Mercury, Uranus, and Mars are in south declination. Not long since all the planets were morning stars. Before November closes Mars, Mercury, and Neptune will be evening stars. Movements seemingly without order are in reality exemplifications of the unswerving laws that regulate the course of every member of the physical universe.

The right ascension of Mars on the 1st is 16 h. 10 m.; his declination is 21° 43′ south; his diameter is 4·4″; and he is in the constellation Scorpio.

Mars sets on the 1st a few minutes after 6 o'clock in the evening; on the 30th he sets at half past 5 o'clock.

THE MOON.

The November moon fulls on the 3d, at 36 minutes after 3 o'clock in the morning. The moon is in conjunction with Neptune on the 3d, and with Saturn on the 5th. She is at her nearest point to Jupiter on the 11th, and to Uranus on the 13th. She makes a charming appearance on the eastern sky in conjunction with Venus on the morning of the 14th, three days before her change, the waning crescent hanging 2° south of the morning star. On the 18th the new moon is in conjunction with Mercury, and on the 19th with Mars.

THE NOVEMBER METEORS.

The earth, as she swings her ponderous bulk in her orbit, encounters on the 13th the November meteor zone, and plunging headlong through the sparsely scattered cosmical atoms, and igniting those that impinge upon her atmosphere, she causes them to descend as falling stars. This gigantic hoop or meteor zone consists of a swarm of particles following Tempel's comet. The unfortunate visitor from the star depths venturing too near the planet Uranus was captured by the giant orb, forced to become a member of the system, and to travel henceforth within its boundaries. The event probably occurred in the second century of the Christian era. The perihelion of the November meteor zone is on the earth's orbit, at the point she passes about the 13th of November, and the aphelion is beyond the orbit of Uranus. The particles of the comet and the swarm of meteoroids have thus far scattered over but one-tenth of the zone, but in the course of time will fill the whole space. As the period of revolution is about 33 years, a grand display of fiery rain occurs only at those intervals. The next one may be expected in 1899.

Observers, however, who watch patiently on the nights of the 11th, 12th, and 13th will be rewarded by seeing a few meteors radiating from the constellation Leo, which are true Leonides, the name given to the members of this meteoric zone, because they seem to start from this constellation. Such is the delightful uncertainty of meteoric astronomy, that the earth may capture a larger number of these little bodies than is anticipated. Therefore it is well to keep a careful lookout.

Aerial Navigation.

In a communication by Monsieur D. Stapfer, engineer, to the *Genie Civil*, he maintains that whatever be the practical value of Captain Renard's aerial ship with electrical motor, it is interesting to note that he has demonstrated the possibility of calculating the elements of the aerial ship according to the formulæ used in water navigation. Thus the experiments of the 9th of August, 1884, have demonstrated that the resistance per square meter of midship section is in direct proportion to the densities of the fluids. That is to say, that the air having a density 800 times less than sea water, the engine which could propel 800 square meters section in the air could only propel 1 square meter immersed in the water. In fact, if to the air ship is applied the well known formula:

$$V = m \sqrt[3]{\frac{F}{B^2}},$$

We find $V = 5{\cdot}50$ m. per second = 11 knots per hour.
$F = 250$ kilogrammeters = 3·3 horse power.
$B^2 = 55$ square meters, or 0·0687 of water.

From which the coefficient m is found to equal 3·00, which corresponds to the factor used in a ship of full body. Monsieur Stapfer, therefore, concludes that in future it will be an easy matter to predict the velocity which an aerial ship can attain according to the gross power developed by the motor, save such changes as are due to fineness of form or disposition of motor. But it remains an acquired fact, that for an air ship of 2,000 kilogrammes of ascensional force it requires 3½ horse power to overcome a wind of 6 meters per second velocity, popularly termed "a good breeze for driving windmills." Thus, to overcome an aerial current of 9 meters per second, it will be necessary to develop 12 horse power, as Messrs. Renard & Krebs had predicted; and Monsieur Stapfer regrets that, having had an electric motor capable of developing as its limit 12 horse power for over an hour, they did not continue the voyage until they had exhausted their power, and were contented to develop only a little more than 3 horse power during 25 minutes.

The Smartest Old Man in the Country.

Seth Cook, of Rathboneville, N. Y., will be 103 years old if he lives until Jan. 10, 1885. On Oct. 16 he went alone to Cowanesque Valley, expecting to meet his son. When he arrived there, he learned that his son was at Gaines. There would be no train for that place until night. Centenarian Cook concluded it would be a waste of time to wait for it, and set out for Gaines on foot. The distance is seventeen miles. He walked the entire distance in six hours, arriving at his son's in good condition, and an hour ahead of the train.

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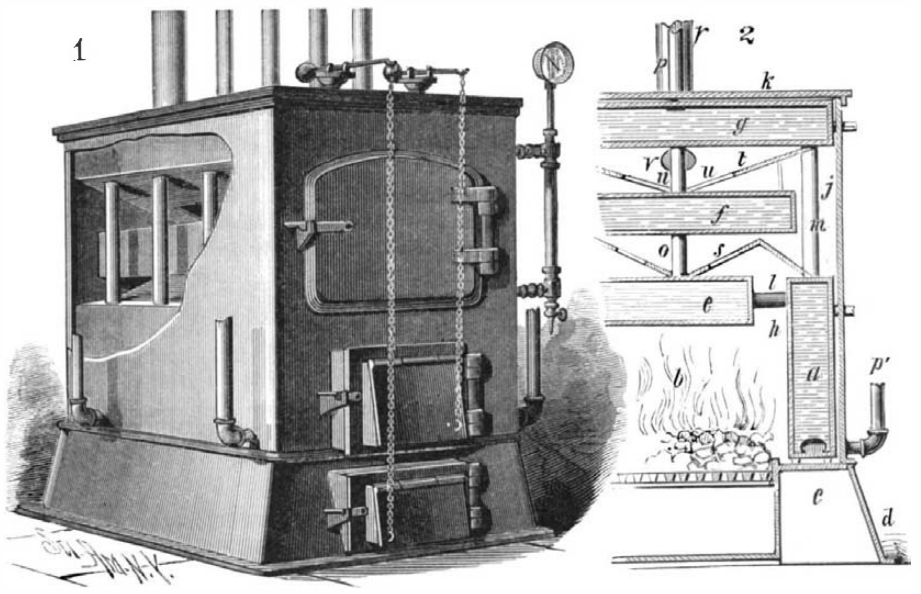
LOW PRESSURE BOILER.

The water holding part of the boiler consists of a series of closed parallel side sections made of cast metal or boiler iron, and of different dimensions according to their position. Two of the sections, *a*, are placed edgewise along the sides of the grate, on the top plate, *c*, of the base, *d*; three or more sections, *e f g*, are arranged horizontally over the fire space, one above the other, with spaces between them about equal to the thickness of the sections. The section, *e*, is sufficiently narrow to leave flue spaces, *h*, between its edges and the sides of the sections, *a*. The intermediate section is wider than the one beneath it, but is arranged, with relation to the sides of the jacket by which the whole is inclosed, to provide flue spaces along its edges. The top section is the full width of the jacket, and is directly beneath the cover. The sections *a* and *e* are connected by horizontal tubes, *l*, and the former are connected by vertical tubes, *m*, to the top section, which is joined to the middle section by central tubes *n*; sections *e* and *f* are similarly joined. The steam or hot water flows away through the pipes, *p*, and returns by the pipes, *p'*. The flue spaces, *h*, are covered by ∧-shaped plates that deflect the heat on to the top of sections *a* before it passes through the passages, *s*, which direct it against the center of section *f*. The heat then divides, and passes up the flue spaces, *j*, to the deflecting plates, *t*, which turn it down on top of section *f*, from which it passes through the openings, *u*, against the bottom of the top section and then into the smoke pipe, *v*. The fire is automatically regulated by the arrangement shown in the perspective view.



ROBILLIARD'S LOW PRESSURE BOILER.

Further particulars concerning this simple and efficient boiler may be obtained by addressing the inventor, Mr. D. S. Robilliard, care Quebec Gas Company, Quebec, Canada.

Chucking Wax.

Sometimes the machinist, as well as the jeweler, requires a means of fastening thin work to the lathe chuck, or to a plate for vise manipulation that will not admit of the use of screws, bolts, or similar means. A number of recipes are extant in the shops for the preparation of a wax for this purpose, but most of them are troublesome to mix and annoying in use. Probably as good a fastener as any is melted gum lac—shellac. All the preparation necessary is to melt the lac in a pan or other receptacle, over a slow fire, and while it is still warm shape it into sticks like those of sealing wax or candy, for convenience in use. To be used, the piece to be secured to the chuck should be warmed over a spirit lamp or gas flame, a little of the lac put on in spots, and while warm attached to the face plate and trued by light taps with a mallet. Or the lac alone may be warmed and put on the work. The work may be detached from the face plate or chuck by gentle heating, or if this is inexpedient, by light taps with a wooden mallet.

SHADE ROLLER HANGER.

The hanger is pivoted to a screw, the construction of which is clearly shown in the side views. The screw is screwed into the top piece of a window frame, one hanger being placed at each end. The lower end of one hanger is formed with a squared socket, open at the top, and in the other is a circular socket, these being designed to receive

MULLEN'S SHADE ROLLER HANGER.

the square and round pins of the ordinary spring roller. The hangers are swung toward the interior of the room to facilitate the placing of the pins in the sockets. By means of this simple device the roller can be hung very easily and rapidly.

Further particulars regarding this invention, which has been patented by Mr. W. J. Mullen, may be obtained by addressing Mr. F. G. Gollon, 107 Walker Street, New York city.

Ventilation.

The ventilation of houses was one of the many interesting subjects discussed at a sanitary convention held in Ionia, Michigan, last December, the proceedings of which have been issued in the form of a supplement to the "Report of the Michigan State Board of Health." Dr. J. H. Kellogg, of Battle Creek, introduced the subject, and dwelt upon the importance of systematic provisions for renovating the air of sleeping rooms, etc. One of the speakers was inclined to contest the necessity of such measures, and doubted if carbon dioxide could reasonably be looked upon as deleterious, except when it was present in large quantities. He added that, even regarding it as highly injurious, complicated arrangements for getting getting rid of it were not needed. "All you've got to do," he said, "is to cut a hole in the wall at the floor, and let the gas run out of the room." The assistant secretary of the convention, Mr. Erwin F. Smith, of Lansing, subsequently criticised this speaker's views as follows:

"The gentleman has overlooked the law of the diffusion of gases, in obedience to which law gases in contact for any length of time must become intimately mingled. This would entirely prevent any such outward flow of the carbonic acid by its own weight as the gentleman would have us believe could easily be brought about by providing an outlet into the open air at or near the floor. He has also overlooked the fact that carbonic acid gas is not the most injurious of the products of respiration. As stated by the lecturer, the organic matter thrown off from the skin and lungs is the most harmful product of respiration. This organic waste matter, when rebreathed, acts as a direct poison upon the animal economy. It is less in quantity than the expired carbonic acid, but occurs along with that, so that when we have established the presence, from expiration, of an excess of carbonic acid in any room, we have at the same time proved that a more deadly, if not so easily detected, enemy is also present. This organic waste matter rises with the warm expired air to the ceiling, whence, as it cools, it is gradually diffused downward. Those who have carefully examined our poorly ventilated State prisons have repeatedly had demonstrated to them by the sense of smell, if not otherwise, that the upper layer of air in a room occupied by large bodies of men becomes soonest charged with foul emanations. In sleeping wards where cells rise above each other in from three to five tiers, the impurity of the air, as shown by the sense of smell and general feeling of oppressiveness, increases as one ascends from one gallery to another, until, toward morning, on the uppermost gallery near the ceiling, the stench and oppressiveness of the air become almost intolerable; and this, too, in spite of the fact that in the State House of Correction, at Ionia, numerous openings have been provided in the outer walls near the floor for the express purpose of ventilation. It is also true, as I know by observation, that prisoners who sleep in ranges of cells near the ceiling complain more of headache, have less appetite, and eat considerably less food than those sleeping in cells near the floor. From these considerations I think it is apparent that a room cannot be properly ventilated by simply making an out door opening at or near the floor."

Shortsightedness.

A writer in the London *Times* claims the cause of myopia to be the application of the eyes to near objects; in other words, the poring over books and handicrafts. When the eyes are directed to a near object, they are turned in or rendered convergent, so that the axes of vision meet upon it, and this position is maintained by a muscular effort which, if continued, alters the shape of the eye in the direction of elongation. Manifestly, the alteration will be most easily effected during youth, when the tissues of the body, including those of the eye, are comparatively lax and distensible, and it will also be most easily effected among those young people whose tissues are exceptionally weak, by reason of inadequate food or of unhealthy descent or surroundings. Badly lighted schools are the great manufactories of myopia, the bad light compelling approximation of the books or other materials of study.

Poisonous Solder in Canned Goods.

Dr. John G. Johnson, having had six cases of poisoning from the eating of canned tomatoes, read an excellent paper on the subject before the New York Medico-Legal Society, which is published in the *Sanitarian* for June. He concludes after a careful review of the subject that:

1. These were not cases of sickness from spoiled tomatoes.
2. They were cases of corrosive poisoning from muriate of zinc and muriate of tin.
3. This poisonous amalgam must be abandoned.
4. Exemplary damages, "at the discretion of the jury," will be sustained by the courts for this reckless tampering with human life in using a dangerous means when a safe one could be used.
5. The canners have only themselves to thank for the present panic in their business, for they have persisted in the use of this dangerous amalgam, knowing it was dangerous.
6. Every cap should be examined, and, if two holes are found in it, send it at once to the health board, with the contents and the name of the grocer who sold it.
7. Reject every article of canned food that does not show the line of resin around the edge of the solder on the cap, the same as is seen on the seam at side of the can.
8. "Standard" or first class goods have not only the name of the factory, but also that of the wholesale house which sells them, on the label. "Seconds," or doubtful or "reprocessed" goods, have a "stock label" of some mythical canning house, but do not have the name of any wholesale grocer on them. Reject all goods that do not have the name of some wholesale firm on the label.
9. A "swell" or decomposing can of goods can always be detected by pressing in the bottom of the can. A sound can, pressed, will give a solid feel. When gas from the decomposition of the food is inside the can, the tin will rattle by pressing up the bottom as you displace the gas in the can.
10. Reject every can that shows any rust around the cap on the inside of the head of the can.—*International Review of Med. and Surg. Technics, Oct.*, 1884.

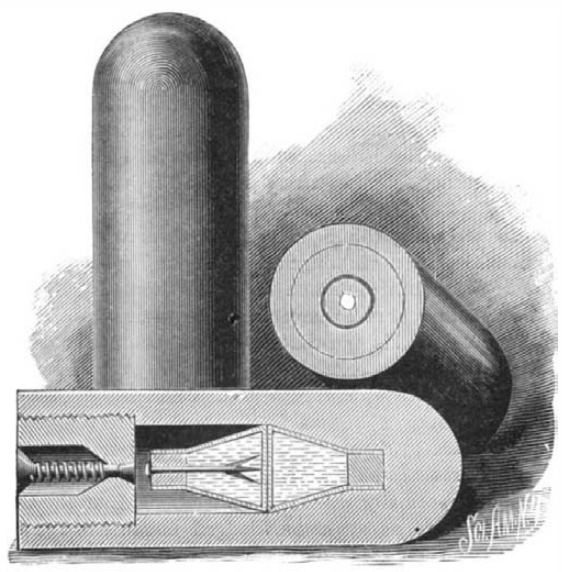
Remedy for Gout.

Dr. J. Mortimer Granville publishes in the *Lancet* (Aug. 10, p. 272) a prescription for the relief of gout, which he states gives satisfactory results in acute and subacute gout, relieving the pain almost immediately, reducing swellings, and raising the proportion of urea in the urine from 50 to 100 per cent. The formula he gives is as follows: Ammonii chloridi, ʒ iv.; potassæ chloratis, ʒ ij.; glycerini, ʒ xij.; tincturæ iodi, ʒ ij.; aquæ ad ʒ xij.—Misce. The dose is two tablespoonfuls every third, fourth, or sixth hour.

IMPROVED EXPLOSIVE SHELL.

The shell is made of cast iron or other metal, and its butt end is closed by a screw plug. In the cavity of the shell are held two funnel-shaped glass vessels, each being formed with a neck which is closed by a stopper. Passing through the stopper in the rear vessel is a rod, the inner end of which adjoins the base of the vessel, and is provided with prongs. On the end of the rod is a head, and in the end of the shell is a firing pin held in a central opening in the plug, and forced toward the outer end of the plug by a spring. The vessels are filled with two distinct liquids which, when they are mixed, form a highly explosive compound.

The shell is fired from a cannon, the force of the explo-



BACHELDER'S IMPROVED EXPLOSIVE SHELL.

sion forcing the firing pin into the shell and breaking the glass vessels, so that the substances mix as the shell leaves the cannon, and form a compound ready to explode when the shell strikes any object. The compound must be of such a nature that it will not explode immediately upon being formed, but will only explode when it receives a heavy shock. The shell is perfectly harmless until the vessels are broken. This invention has been patented by Mr. J. L. Bachelder, of Globe, Arizona.

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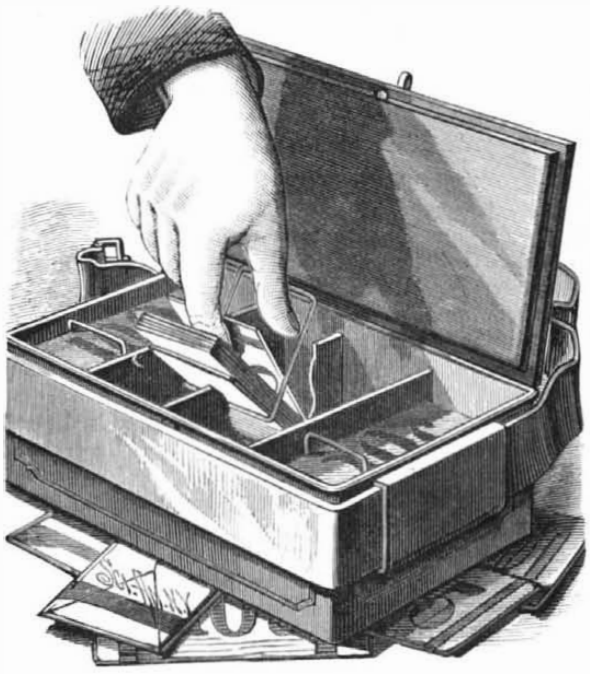
STREET CAR DRIVER'S CHANGE BOX.

A simple, inexpensive, and convenient means for removing the change envelopes from the boxes used on street railway cars has been invented by Mr. J. G. Holden, of Danville, Ill. The cover of the box is hinged along one side, and is held



HOLDEN'S STREET CAR DRIVER'S CHANGE BOX.

shut by a spring catch having a finger bar by which it may be released to open the cover. A strap passing through loops on the box buckles around the driver's waist, the box being in front and slightly toward the left hand. The box is divided into compartments for holding separate piles of money or envelopes. At the bottom of each compartment is hinged a floor to which is rigidly fixed, near its outer end, a wire frame. The side bars of the frame are far enough apart to receive the piles of envelopes between them. The floors incline downward from the hinge to carry the envelopes by gravity toward the outer side of the box, and leave a space behind them to prevent cramping or bending the box when the floor is raised. When the driver wishes to obtain an envelope, he places his thumb under the cross bar of one of the frames, and lifts it and the floor. The envelopes are thus brought end upward, when one or more may be removed from the pile, the remaining ones dropping back into box.

Leather Faced Pulleys.

A competent and experienced millwright gives as the result of his experience of thirty-eight years that iron pulleys should be faced with leather, particularly if the belt is not to be shifted, as from fast to loose pulley. His plan is to cut the leather of the proper width, slightly wider than the pulley face, soak it soft in water, and then apply it to the pulley by stretching, using copper rivets to secure the butt joint and an occasional rivet on the edge. The leather is put on with flesh side outward. Next to the leather face he prefers a built-up wooden pulley, the segments of wood to be secured in an iron frame with the ends of the grain outward. Such pulley faces he claims to be greatly superior to polished iron or to wood with the grain horizontal.

Ingrowing Nail.

In a note to the *Union Medicale*, M. Monod states that during the last twenty years he has treated ingrowing nail by a very simple and effectual method, which does not involve the removal of the nail. He makes a free application of nitrate of silver at the commencement of the affection, without isolating the nail. If the cauterization is carried deeply into the diseased furrow, the patient has usually, even by the next day, derived considerable relief, and is able, even thus early, to walk in moderation with an easy shoe. Extirpation of the nail should be reserved for quite exceptional cases.

IMPROVED COLTER HANGER.

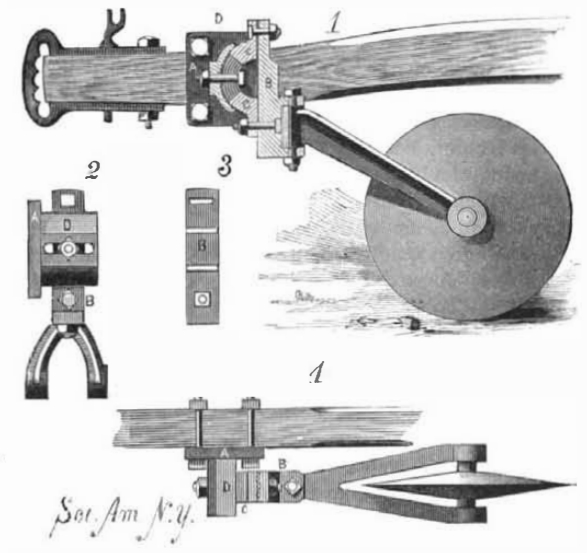
In the engraving Fig. 1 is a sectional side elevation, Fig. 2 is a front end view with colter removed, Fig. 3 is a rear view of the back plate to which the colter fork is jointed, and Fig. 4 is a plan view of an invention lately patented by Mr. Hanc Shaw, of Campbell Hill, Ill. The hanger is secured to the plow beam by bolts passing through the plate, A, projecting at right angles from which is a curved flange having serrations formed transversely across its rear face to engage with serrations on the front of a curved block, C, which is slotted vertically through the center to permit the passage of a bolt. By this means the block may be held firmly to the plate, and may be shifted on the flange to adjust the colter as to height for regulating its depth of cut in the soil. The colter is hung in a fork pivoted on a bolt passing through lugs projecting from the rear side of the plate, B, which is bolted to flanges on the block, C. The upper bolt hole is slotted, so as to allow the plate, B, to swing on the lower bolt as a center, for adjusting the colter in perfect parallelism sidewise with the landslide of the plow, and to cut freely in advance of the plow, so that the latter will run true and may be guided easily. The opposing joint faces of the block and plate, and the ends next the upper bolt, are serrated to prevent slipping when the nut is screwed down. The colter may swing sidewise on the bolt to clear itself of obstructions. By turning the plate, A, up side down the hanger may be adjusted either to right or left hand plows. All parts of the hanger are simple, strong, and durable, and the adjustments for every possible requirement can be easily and quickly made by any one capable of handling a plow.

Sulphur a Remedy for Cholera.

The carrying of a roll of brimstone in the pocket is believed by many persons to be a sovereign remedy for rheumatism, but we believe it has been left to a Doctor Herring to establish the fact that a half drachm of the flowers of sulphur worn in the foot of each stocking is a sure preventive of cholera, and that one clad as it were in this sanitary armor may walk unscathed through the very hotbeds of the disease. Any lingering doubts as to the efficacy of this method, the New England *Medical Monthly* facetiously asserts, are dispelled by the fact that while the doctor, who lives somewhere in England, has not had for the last six months a single death from cholera in his practice, a large number of the Egyptians, who unfortunately had no stockings, and were, therefore, unable to apply the remedy, succumbed to the disease.

Telephony in Australia.

In 1882, under the provisions of an act which had originated with Hon. C. Todd, Postmaster-General and Superintendent of Telegraphs, a telephone system was adopted in South Australia, and there are now 217 members connected with the Adelaide Exchange. At the commencement of the year the subscribers in the other colonies were: Melbourne, 650; Ballarat, 81; Sandhurst, 37; Sydney, 260;

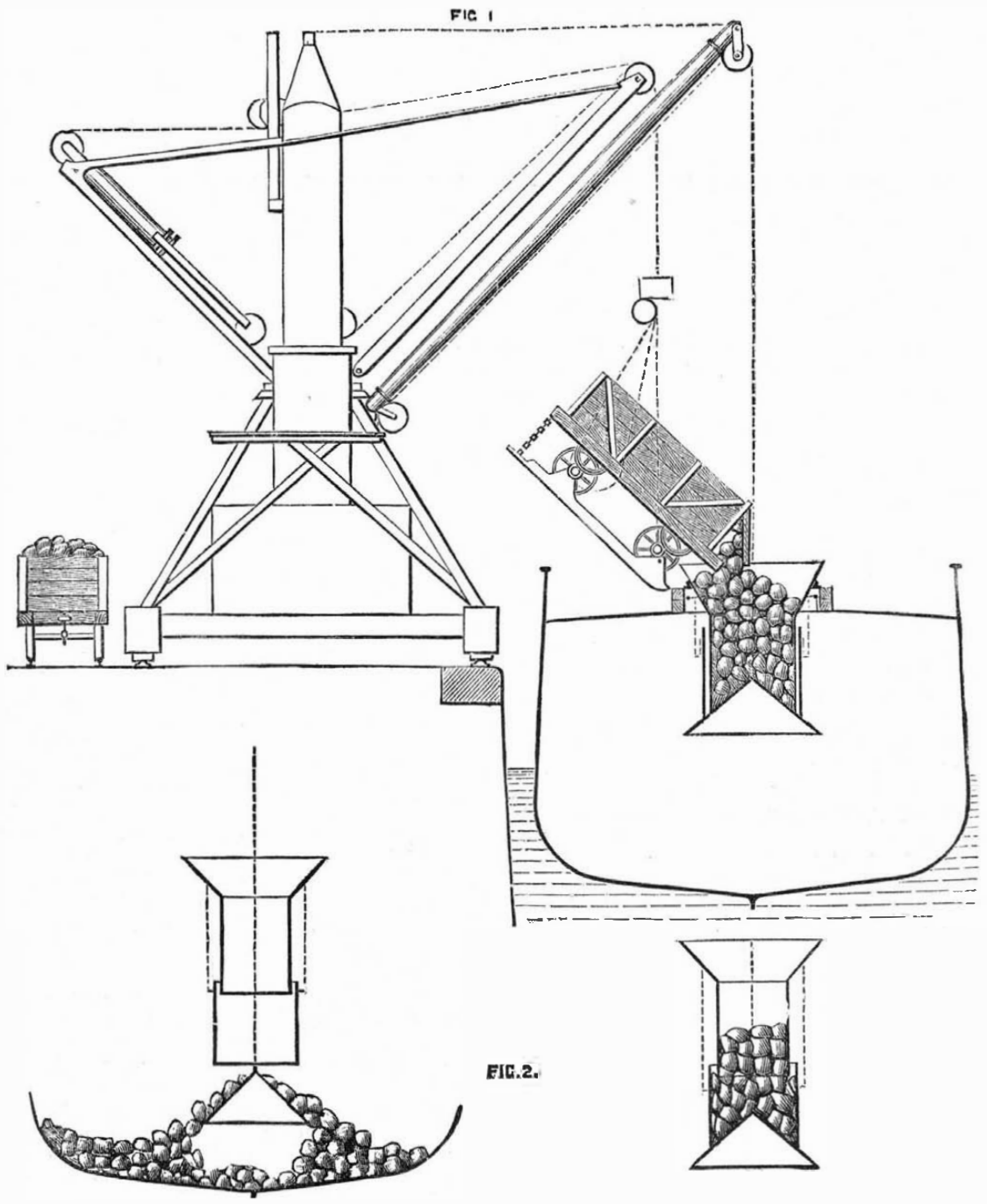


SHAW'S IMPROVED COLTER HANGER.

Dunedin, 237; Auckland, 151; Christchurch, 125; and Wellington, 60. A good proportion of the telephones now used in Australia are of American make.

IMPROVED COAL CRANE.

Mr. Westmacott's coaling cradle must be looked upon as the key to the successful application of movable coal shipping appliances. It may be described as a light platform suspended by chains, which takes its seat on an ordinary line of rails in any position. It is suspended on what may be called an anti-friction swivel, which enables a man to turn the cradle with a loaded wagon on it, thereby dispensing with turntables. There are no tipping chains to hook on and off every time a wagon is shipped, as is the case with coaling cradles of the usual construction; the tipping chains in this case pass through the center of the swivel attachment, and are permanently connected with the cradle. The crane itself, as shown in Figs. 1 and 2, consists of a nearly square wrought iron pedestal or base, tapering upward, which is carried on four wheels, one near each corner, running on rails of 24 feet gauge laid parallel to the quay wall. These wheels, however, are used only for traveling on; the whole of the weight when working is taken by four hydraulic jacks, one at each corner, which effectually prevent any movement of the crane. Rising out of the top of the pedestal, and revolving in bearings at the top and bottom of it, is the pillar, consisting of two flat plate girders, between which is placed the hydraulic cylinder for lifting. The chain from this cylinder passes over the jib head, and both ends are attached to the cradle. The jib is attached at the lower end to the front of the pillar, just above the pedestal; and at the outer end by stays to the top of the pillar. At the back of the pillar is fixed a second hydraulic cylinder, which effects the tipping of the wagon by making a bight in the tipping chain that passes over the jib head to the cradle. The tipping chain is always kept taut by a third hydraulic cylinder placed on an inclined frame, which is fixed to the pillar at the back in the same way as the jib is in front. Thus the tipping cylinder proper needs to have a short range only. The inclined cylinder and its frame act as a counterweight for balancing in some measure the load hanging from the jib head. The turning of the pillar and jib is effected by a pair of hydraulic cylinders, one on each



NEW MOVABLE CRANE CARDIFF DOCKS.

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side of the pillar, fixed to the base of the pedestal, which itself remains stationary. The chain from these cylinders passes round a drum at the foot of the pillar. All the motions are controlled with the greatest ease by one man in a valve house on the side of the pedestal. There are two of these houses on opposite sides of the machine, so that he can use whichever is most convenient for enabling him to see into the vessel. The pressure water is conveyed to the crane by movable and jointed pipes, which can be attached to hydrants placed at convenient distances on the hydraulic mains along the quay wall. There is an auxiliary or anti-breakage crane on the side next the dock, the foot of the jib being carried from the pedestal and the top by means of a chain from the top of the pillar, the invention of Mr. Charles Hunter, engineer to the Bute trustees. By an arrangement of a hopper resting on the deck, with telescopic throat, which is closed by a conical bottom or valve held up by the auxiliary crane, the first few wagonfuls of coal can be lowered quietly to the bottom of the hold, and a conical heap formed for the following coal to fall on, as is done at the hoists, so as to lessen the breakage of coal. When the anti-breakage crane is not in use it can be swung to one side, clear out of the way. It is found in actual work that a wagon can be shipped in from two and a half to three minutes. The crane was designed and constructed by Sir William G. Armstrong, Mitchell & Company, and is similar to their well known and largely adopted movable hydraulic cranes for cargo and ballast work. These cranes were first introduced at the suggestion of the writer about fourteen years ago at the Atlantic Wharf of the Bute East Dock, to supersede fixed cranes. The introduction of the movable crane resulted in such an increased amount of work and dispatch to steamers that all the dock companies very soon recognized the importance of adopting cranes of this type. At the Royal Albert Dock, London, there are about ninety of these cranes. The number of tips for shipping coal at the Bute docks is now as follows: Thirteen balance tips at the west dock; twelve balance tips at the east dock; eight hydraulic tips at the east dock and entrance basin, shown at H H; one hydraulic tip in the entrance channel for loading in the tideway; eight hydraulic tips at the Roath basin; forty-two total number of tips. One movable hydraulic crane capable of lifting twenty-five tons. Each tip is capable of shipping 1,000 tons of coal per working day; the total shipping capacity of the Bute docks is therefore equal to nearly 12,000,000 tons of coal per annum. In some instances as much as 200 tons of coal have been shipped per hour at the hydraulic tips; and it is now not uncommon for a steam collier of 2,000 tons burden to enter the basin at high water of one day, discharge her ballast, receive her outward cargo, and leave at high water the following day, the entire operation having occupied less than twenty-four hours. The principal portion of the trade carried on in the Bute docks is the export of coal and iron, which amounted to 2,750,000 tons in the year 1873, and to 6,916,000 tons in 1883. The import trade of iron ore, timber, and general merchandise amounted to 630,000 tons in 1873, and in 1883 to 1,299,000 tons.—*The Engineer.*

Two Good Remedies for Sprains.

From the same cause which renders necessary such contrivances as the nose straightening mask, illustrated in last week's issue of this paper, broken legs, sprained ankles, and wrenched wrists are produced. The following new remedies for sprains are said to have proved very efficacious. Dr. Thos. L. Shearer recommends and practices the use of clay, such as is used for making bricks, free from gravel, dried, and finely powdered in a mortar. This powdered clay is mixed with water into a thick and moist consistence. This is then spread on muslin to the depth of a quarter of an inch, and applied entirely around the part. Over this is placed a rubber roller bandage, just lightly enough to keep the dressing from shifting, and retain the moisture. This application should be renewed every twenty-four hours. It appears, by this method of treatment, the most severe sprains are cured much more rapidly and satisfactorily than by the old system.

The same authority states that powdered dried earth sprinkled on the surface of an ulcer, and kept in position by adhesive straps, is a capital dressing for cases which are so weak that even the weakest ointment tends to break down the granulations.

Professor Brinton, another celebrated practitioner, says that the best thing for a sprain is to put the limb into a vessel of very hot water immediately, then add boiling water as it can be borne. Keep the part immersed for twenty minutes, or until the pain subsides; then apply a tight bandage, and order rest. Sometimes the joint can be used in twelve hours. If necessary, use a silicate of sodium dressing.

No Cats.

There is not a single cat within the limits of the town of Leadville, Colorado. Cats have been imported there by the hundreds, and in all varieties of color and size, but not one has ever survived the second week of residence. However, as there are no rats and mice in Leadville, there is no real need of cats, and it makes little difference whether they live or die. The thin atmosphere at that altitude (10,200) is as fatal to the vermin as to their foe, and the inhabitants are thus mercifully spared the inflictions of both.—*Chicago Inter-Ocean.*

AN IMPROVED GUN SIGHT.

The form of this sight, and the optical principle involved in its construction, will be readily understood from Fig. 1, which shows it in perspective and in vertical section. When aiming, the sight has the appearance of a ring or hoop, which shows the front sight and the object aimed at

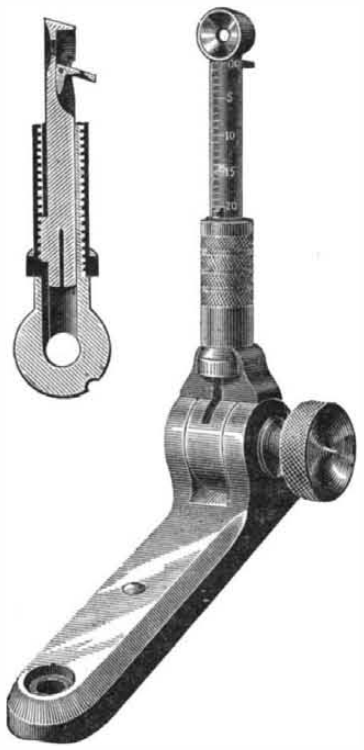

Fig. 1.—LYMAN'S REAR SIGHT FOR RIFLES.

without intercepting any part of the view. Fig. 2 gives an approximate idea of how the sight appears when aiming, and Fig. 3 shows how the common open sight appears. In the first it will be noticed that the top of the rifle barrel and the front sight are seen as distinctly as if no rear sight was used; while in the second the most important part of

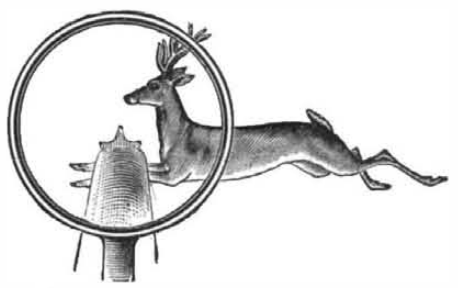

Fig. 2.—APPEARANCE OF SIGHT WHEN AIMING.

the view is shut out, and there is great difficulty in quickly getting the front sight in the notch of the rear sight. The aperture in this sight, being very near the eyes, is greatly magnified as compared with the notch in the common sight; and although this may cause the impression that an aperture which looks so large cannot allow of accurate

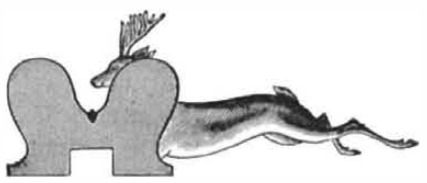

Fig. 3.—APPEARANCE OF COMMON OPEN SIGHT WHEN AIMING.

aiming, it is true that the larger this small aperture looks, the more accurate the aim. The accuracy is also increased, as the distance from this sight to the front sight is nearly twice as great as from the ordinary open sight to the front sight. The rim of the sight can be instantly changed, to give it a large aperture with a narrow rim or a small aper-

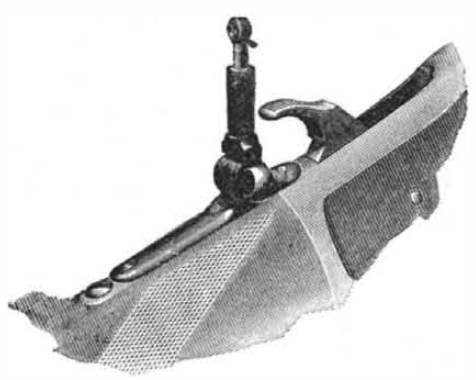

Fig. 4.—SIGHT ATTACHED TO IMPROVED BASE.

ture with a wider rim. The sight can be easily placed upon any rifle. Fig. 4 shows a sight attached to an improved base, lately patented, which not only looks better on the gun than any other rear sight base, but it allows of greater elevation for shooting.

The inventor, Mr. William Lyman, of Middlefield, Conn., to whom inquiries should be addressed, has received many highly commendatory letters from those who have repeatedly tested the efficiency of this sight. Dr. J. W. Wright, president of the New York Rifle Club, states that his experience with it has "involved almost every variety of shooting at the shorter ranges, *i. e.*, up to 500 yards, and it has been used for large and small game, in dark woods and in bright sunlight, across water and overland, and I am convinced that, for quick work, it is unequaled. It gives the hunter all the advantages of an abundance of light, together with a complete view of the surroundings of the object to be hit."

Some Useful Notes for Engineers.

Among the questions most frequently asked of our inspectors when making their ordinary visits, says the *Locomotive*, are the following, which are of such general interest to engineers as to warrant publication:

1st. How much water per pound of coal should be made into steam at 60 pounds pressure per square inch with 60 inch tubular boilers properly made, well set, and carefully fired?

Under the above conditions, from 8 to 10 pounds, dependent somewhat, of course, upon the quality of the coal and the temperature of the feed water.

2d. How much more coal per pound of water does it take to carry 80 pounds per square inch than it does to carry 60 pounds per square inch?

This question could with more propriety be put as follows: How much more heat does it take to make a pound of steam at 80 pounds pressure per square inch than it does to make a pound at 60 pounds per square inch?

Practically, no more coal will be required; theoretically, about 0·4 of one per cent, or about 1-250 part more.

3d. Do you get enough better results from steam of 80 pounds per square inch than you do from steam 60 pounds per square inch to pay the extra wear and tear of boiler and engine?

Depends entirely upon conditions. If you can make use of steam of 80 pounds pressure, it pays to use it; there are conditions, however, where 60 pounds, or even less, would be decidedly more economical.

4th. How much more heat do you get from pipes carrying 60 pounds pressure than from pipes carrying 10 pounds pressure?

Two and one-tenth per cent more heat will be given out per pound condensed from steam of 60 pounds pressure than from steam of 10 pounds pressure, in falling from temperature due to the respective pressures to 212° Fahr.

5th. What proportion of direct heating surface to the volume of a fairly protected room is required to maintain the temperature of the room at 60° Fahr. in buildings heated by steam?

From 1-75 to 1-250, according to size and exposure of room.

6. How much is a given amount of steam reduced in bulk by compressing it from 60 pounds per square inch to 80 pounds per square inch?

About 20 per cent. See any steam table.

Working Hard Iron.

In a little jobbing machine shop the proprietor and sole workman was sweating and swearing over the obduracy of a lot of very thin castings which he was trying to drill for riveting, and to file for fitting. Some of the castings were very hard, and ground out and broke drills at a fearful rate. Where the grindstone or the emery wheel could reach, they were used instead of the file. Many of the pieces were rejected because of their hardness, and it was thought necessary to make them of iron to be made malleable at a greatly enhanced cost.

A visitor suggested the use of spirits of turpentine on drill and file. After some demur it was tried, and the work proceeded. The speed of the drill was somewhat reduced from that of a drill in soft gray iron, but the obdurate material yielded to the persuasive influence of the turpentine. The file was kept wet with it, and there was no difficulty in cutting the hard metal. It is ascertained, however, that the supply of turpentine must be continuous—a common mucilage brush is handy for the purpose—and that the turpentine, evaporated and oxidized by exposure until it is somewhat viscid, is better than the limpid spirit, as having more body.

Bursting of a Fly Wheel.

In Boston, Mass., on October 18, an iron fly wheel weighing 125 pounds, and attached to a wood sawing machine in a coal and wood yard, burst into many pieces, which flew in all directions, smashing wagons and other objects, but killing no one. One piece, weighing about 50 pounds, took a singular journey. It was propelled straight into the air, and descended in the front entry, just inside the door, of a wooden dwelling house, a distance of 400 or 500 yards. The piece crushed through the flat roof of the dwelling, which is a two and one-half story structure, carrying away plastering and laths. It then went through a feather bed in the room, and taking an oblique course went through the wall about six inches from the floor, dragging with it a portion of the mattress. The flying missile struck the bed at its head, and just where a person's head would naturally lie if the bed was occupied. Pursuing its course, the iron fragment still descended with frightful velocity, carried away a portion of a flight of stairs, and went through another wall, where its further progress was stopped.

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EXHIBIT OF THE BRUSH ELECTRIC COMPANY.

(*Continued from first page.*)

origin, the one from the other. For, as could be seen in the exhibit, these incandescence lights may, in the Brush system, be generated both from the dynamo direct and through the interposition of the storage battery.

Of all the apparatus exhibited in the two great buildings of the Exposition, it is safe to say that nothing attracted more attention or was so attentively and continuously observed as the storage batteries in the Brush exhibit One of these batteries was placed in the exhibit on the ground floor and another in the west gallery. Both were in active operation, furnishing light for the incandescence Brush-Swan lamps, and so arranged that the general visitor, who came with rather confused ideas about the properties of storage batteries, could observe their working, and depart thence with some idea of their utility and convenience.

The scheme to charge these secondary batteries during the day by the use of the same wires which at night furnish the current for the arc lights was graphically set forth, and the advantages of the system explained.

For the purpose of practically illustrating their system of domestic lighting, a parlor, bedroom, and an additional chamber were exhibited by the Brush Company, the two first being lighted by the Brush-Swan incandescence lamps, fed by a secondary battery, and the third containing two looms driven by a Brush motor This motor was fed by the current taken from the battery by the same wire that supplied the lamps.

While the battery is in operation it has an E. M. F. of 37 volts, and is charged at the rate of twenty amperes Under ordinary circumstances it will feed forty lamps, each of sixteen candle power, and is said to have the ability when once thoroughly charged of furnishing 250 hours of light, whether used in large or small quantities.

Affixed to the wall in the west gallery was the manipulator of one of these batteries, by which the contact between the dynamo station, the battery, and the lighting apparatus was automatically maintained. By this ingenious contrivance the current is permitted to enter and charge the battery, and is cut off when the process is complete; to permit the current to flow into the lighting apparatus, and to check it when light is no longer needed.

The battery itself consists of twenty-one cells, each of which is composed of three plates of cast lead, the center one being an oxygen plate and those on either side hydrogen. The plates measure 16x16 inches square and are connected, the two outside ones with the middle plate of the neighboring cell—a system known as "series." As the electric current traverses the cells, it results in the decomposition of the electrolyte ($H_2SO_4+H_2O$), the two outside plates absorb hydrogen, and the center plate absorbs oxygen; the hydrogen and oxygen thus absorbed join again, and acting as a battery are resolved into water. A meter was attached to the batteries exhibited, which indicated the amount of light used, or rather the amount of current that had passed. The innumerable little incandescent lamps fed by these batteries were connected by wires hidden from view. Whether the battery was being charged or already complete, there was no noticeable difference in the intensity of the lights, which were kept aglow during the one period as well as at the other.

Besides furnishing light, it was shown at the Brush exhibit that these batteries could likewise be made to furnish power, not only in small quantities, as was shown by running the two looms in the exhibit, but sufficient for running street cars, boats, tricycles, and the like. Improvements are being continually made in regard to efficiency and simplicity, and consequently the cost is being lessened.

In the parlors which constituted a part of the Brush exhibit, circles of colored lamps, fed both by dynamos and secondary batteries, cast a steady and well diffused glow upon the elaborate paneling of the walls, and without a series of arc lamps poised on wooden columns stood like sentinals to mark the approach to the general headquarters.

As a practical illustration of "multiple arc," a hundred and sixty lamps glowed behind a finely wrought screen, while in front a dynamo of noiseless though rapid movement furnished the energy.

Still further northward from the headquarters exhibit, the Brush Company maintained six dynamo electric machines in motion; and from the same engines which supplied the power for these, an electro-plating machine of the Brush type, situated near the Brush parlors, was operated. This plating machine is in most respects similar to the arc light machine, except that the field magnets are coarsely wound in general circuit, in order that the E. M. F. may be retained at the low degree required for the class of work for which it is designed.

At the evening exhibitions it was shown that in these plating machines the largest portion of electricity produced from a given expenditure of power may be utilized for external work—the plating being done in the baths—and the minimum being absorbed in the machine itself. The result is that the machine does not become hot when doing its maximum amount of work. It does not require water to keep it cool, and is so arranged that its poles cannot reverse while running. The adjustability of the brushes at the commutator prevents its wear by an undue amount of spark, and its parts, being interchangeable, may, in case of accident, be quickly replaced. A most ingenious device for connecting up the currents from the armature prevents that pulsation of current which heretofore has proved so annoying to manufacturers of electro-plated ware. In order to ascertain the polarity of this plating machine, two small wires are run from the binding-posts, and, when their ends are dipped in the solution, the wire which gives off gas profusely is the one to be attached to the rod in which the work is placed; the other wire being attached to the rod in which the anodes are hung.

Near this electro-plating machine were exhibited three arc-light machines of the Brush pattern, one having a power of seventy arc-lights, each of 2,000 candle power. The dynamo machines used to supply the Brush-Swan incandescence lights are seen to be slightly modified for that special purpose In these the field magnets are compound wound, being in part shunt circuit and in part open circuit; the armature wire was in like degree coarse. Machines of this nature, each with a capacity of 150 incandescence lights, were in the exhibit. The machine used in supplying the Brush secondary battery was classed as of fifteen arc-light capacity.

The lamps shown in the exhibit were Wall lamp incandescence for bracket, ornamental swinging lamp, groups of sixteen candle power lamps for parlors, each lamp jutting out of a globe made in imitation of a flower, the large incandescence projecting downward from ceiling, and various descriptions of arc-lamps for street and theater.

The Brush-Swan incandescence lamp exhibited is exceedingly simple in construction. It consists of a small glass globe from which the air has been excluded, and in which is placed a thin film of carbon, forming a complete coil. On passing the electric current through the carbon it becomes intensely white heated, and emits a beautifully soft, clear, and steady light. The carbon not being in contact with the air, there is no combustion, and consequently no vitiation of atmosphere.

The lamp has no mechanism, and when it fails from use or accident, may readily be replaced by another. Its power varies from sixteen to one hundred candle power; the standard size being sixteen candle power. It has an average life of 1,000 hours, but may glow for several times that period. With but little cost it can be adapted to any gas fixtures, the wires being run through the pipes out of sight. It can be turned on or off by means of a key or button made of rubber, and each lamp is entirely independent of its neighbors. Every lamp is provided with a safety attachment. In case of accident to the line by short circuiting, the circuit is instantly broken. The wires leading to the fittings are carefully insulated in a fireproof material which prevents accidents by fire. They may be run between walls and floors or through partitions with safety, or inclosed, as at the Exposition, in ornamental wood strips crossing the ceilings.

The Brush dynamo-electric machine, which may be said to be the base of the whole Brush-Swan system, was shown in the exhibit, not only as an entirety, but exposed so that all could see its parts and comprehend the theory upon which it is based. It is a modification of the Gramme machine, and its most striking feature consists in the arrangement of the collectors and coils, whereby each pair of the four pairs of coils is, in turn, cut out of the circuit during one-eighth of a revolution, so that there are only three pairs of coils in circuit at one time. The object is to get rid of the waste of energy necessitated by sending a current through one pair of coils during the time at which they are of little service and cutting few lines of force. As might be supposed, this is when the coils are at an angle of very nearly ninety degrees to the lines of force; for at this time the number of lines of force passing through these coils is at a maximum, but their rate of change at a minimum, because the rate of change varies as the cosine of the angle. There are two sets of brushes and four commutators, one commutator for each pair of coils. Each brush is made to touch the commutators of two pairs of coils which are not contiguous, but at right angles to each other. The two strips of each commutator are separated from each other by about one-eighth of the circumference, so that whenever these insulating spaces come under a brush the pair of coils corresponding to this commutator are cut out of the circuit.

The brushes are so placed that they come over these insulating spaces just at the time when the coils corresponding are in the position of minimum action, and they come into contact with the strips of the commutator again when they are approaching a position of greater effectiveness. In this machine the four pairs of coils form four independent machines, the two coils of each machine being in series; but the four machines are joined in two pairs by the arrangement of the collector, the two machines thus formed being joined in series at the last, so as to generate one continuous current of high electro-motive force. Of the two machines thus joined in series, one has one pair of coils in the position of maximum effect, the other pair in the position of minimum effect, and therefore cut out. The other machine has both pair of coils in circuit and both in positions of medium effect. The current finally generated may therefore be said to be that of two machines joined in series, one machine having two coils in series in a position of maximum effect, the other machine being composed of two machines joined in parallel, each of these machines consisting of two coils joined in series and occupying positions of medium effect.

A very interesting part of the Brush exhibit were the great arc lamps which the company use for lighting up towns and cities by a system of light towers. These lights are of the regulating order, and have as much to do with the success of the system as the dynamo itself. They are made to burn continuously for eight, sixteen, twenty-four, or indeed for any desired number of hours, and so simple is the mechanism that it is only necessary to place one of the lamps in position to insure its working. These lamps are of the double carbon or sixteen hour type, and, as in many other description of lamps, the upper carbon falls by its own weight upon the lower carbon, and thus closes the circuit. The pencils of carbon within these lamps are about 12 inches long, and coated with copper. They last about eight hours, by which time about 9¼ inches of the positive and about 4 inches of the negative carbon are consumed. If it is necessary that the lamps should burn a still longer time, the double carbon lamp type are employed, these being fitted with two pairs of carbon holders. When one set of carbons is consumed, the change to the other pair is effected by mechanical means, and simply.

Telegraphing Extraordinary.

A contemporary supplies some interesting particulars as to the number of words transmitted by telegraph to all parts of the kingdom of Great Britain on the occasion of the Prime Minister's recent visit to Edinburgh. On the evening of Mr. Gladstone's arrival, press messages containing over seventeen thousand words were handed in at the telegraph department of the General Post Office; but the actual number of words transmitted was over sixty-seven thousand, owing to the fact of the same report being sent to more than one newspaper. Mr. Gladstone's visit to the Forth Bridge works led to the transmission of twelve thousand words, and his movements on the following day to nineteen thousand. On the occasion of his first speech on Saturday evening (August 30) in the Corn Exchange, sixty-two thousand four hundred and seventy-one words were handed in, and one hundred and thirty-eight thousand four hundred and forty-five transmitted. The number would have been greater had not Sunday intervened, allowing of the transmission of many messages by train. On Monday evening (September 1) the press messages reached the enormous number of one hundred and seventeen thousand words, causing the transmission of about four hundred and twenty-seven thousand words, the largest number ever transmitted on any one night from Edinburgh. After the Waverley Market speech of Tuesday night (September 2), one hundred and seventy-two thousand eight hundred and twenty-one words were transmitted.

On Monday evening, when the strain was heaviest, one hundred and thirty operators were at work, and in spite of the constant stream of messages the department kept abreast of the reporters. As many as four towns in the same telegraphic circuit were enabled to read almost the same message at the same time. The message having been "punched" on long slips of prepared paper, the plan was adopted, instead of running it entirely through one machine, of taking the slip out of the first machine after it was three yards clear, and running it into a second and a third.

Cobalt Bronze.

Under the above name we have a new alloy introduced by Wiggin & Son, of Birmingham. Cobalt bronze is a whiter but slightly more expensive metal than silveroid. It is, perhaps, the more interesting of the two, because there is introduced into its composition small quantities of the metal cobalt. The malleability of cobalt in a pure metallic form has long been understood, but we believe it was not until a few years ago that it was demonstrated by Messrs. Wiggin that it might be rolled into sheets, and wrought like other metals into articles of utility. Its high price, however, interfered with its production, and militated against its use. This fact induced Messrs. Wiggin to endeavor to compound an alloy, in which the sterling qualities of this valuable metal could be fully represented, and which, at little more than the cost of ordinary German silver, might possess in a large degree all the attributes of the pure metal itself. Possessing, as it is said to do, many of the qualities and every appearance of metallic cobalt, it is manufactured in several qualities, the higher grades being preferable, on account of their suitability for casting purposes, their close, steel-like surface, their susceptibility of a high polish, as well as their hardness, toughness, and great tensile strength.

Panacea for Trouble.

Life is filled with trouble, as a writer in *Our Homes* has said, and we must shoulder our share with the best grace we can. We may only seek to make them as light as we can, since to avoid them is impossible.

There is one sovereign panacea for this. It is work. Brooding over trouble is like surrounding one's self with a fog. It magnifies all objects seen through it. Occupation of the mind prevents this; hard work, manual work even, gives the mind other matters of concern, tires the body so that sleep will come.

Very few suicides occur when men are actively employed. When out of work they think of their other troubles, and the despondency arising from this added one throws the mind from its balance, and the fatal deed is done. Many a man would have committed suicide if he had had the time. Work of any kind, especially work for others, is the great panacea for a troubled mind.

AN Alaska U. S. Signal Corps observer writes us of the discovery of a wonderful medicinal spring in that Territory, long highly esteemed by the Indians and greatly valued by the few whites who yet know of it.

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STEAM CATAMARAN.

The boat consists of two pontoons each 2′ x 30′ and 1′ 8″ deep placed 4′ apart. Beams 2′ from centers connect rigidly the pontoons; on these is laid a floor of ¾″ matched boards. These beams are secured by ⅜″ bolts 25″ long extending from bottom of boats to top of deck beams. The pontoons are covered water tight, and each divided into two tight compartments. The upper works are formed by stanchions with carline beams, on which is the upper deck of ⅝″ timber. The pilot house is well up, so wheelsman can see fore and aft. An opportunity is also provided for stearing in cabin, which is inclosed with canvas curtains secured to stanchions, as are carriage curtains, only stronger. In the cabin extra stanchions are set up when wanted to support folding cots, all of which takes but little room, by day, when not wanted.

The boats are nearly straight on inside lines, gathering enough water, as as I find on trial, so that, with the draught back, caused by the wheel, the water remains same height between the boats, when running, as outside. This is my second experiment in steam catamarans, and I am convinced it is the best plan for steam yachts up to 60′ and perhaps longer, for the following reasons:

1. It is not cranky—"stiff as an island" they say—half a dozen men on one side scarcely change the level even of this small boat.

2. Safety from sinking—the four air tight compartments must all be filled before it will go down.

3. Cleanliness—all ashes and cinders go direct from the fire box to the water below.

4. Speed—nine miles an hour in still water. 5. Protection of boats from weather—the floor forming a sun shade.

6. Roomy—place for six to sleep in cabin; ice box, lockers, oil stove box, and coal bunker forward, and all accessible.

The power is a 4 x 6 engine and upright steel boiler with seventy 1½″ flues 24″ long submerged. I think that with 120 pounds boiler pressure I obtain about 260 revolutions, which gives about 5 horse power. The engine is faulty in construction in that the exhaust is but two ¾″ pipes from either side of steam chest, the area of both but little more than one 1″ pipe. With 60′ of heating surface more steam could be made, with poor wood, than the engine would use.

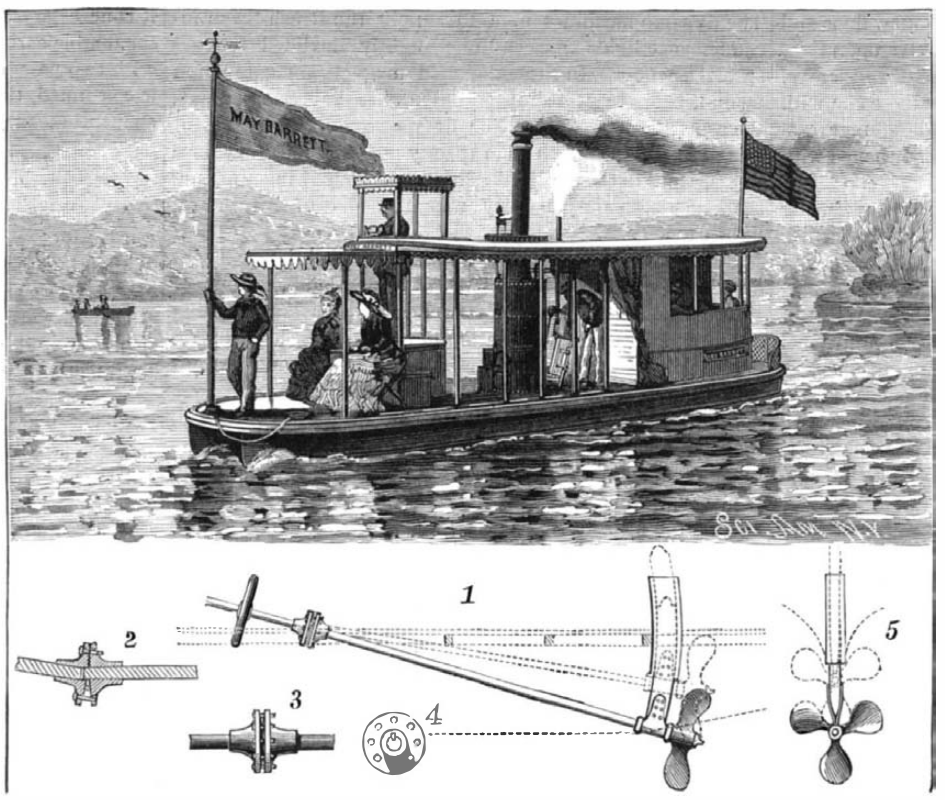
The boiler is all above the furnace. The grate is hung in center, and dumps into the water between the boats. My plan for feeding boiler I think is novel. From the deck pump the water is all forced through the feed pump, thus facilitating "starting" the feed pump, making it almost a certainty. When at dock with steam up, the waste of water is very easily supplied by hand, and more surely than with any small inspirator I have seen. By a simple device the leverage is changed when pumping by hand against a head of steam. The feed pipe coils around fire, and only hot water enters boiler. The inlet is in center of lowest point in boiler, taking place of one tube. An outside vertical circulating pipe secures good circulation.

The wheel is 3 bladed, 24″, and is arranged to be raised in shallow water, being attached to main shaft by universal joint which is shown in Figs. 1, 2, 3, 4, and 5. The flange faces are 7″, turned to segment of sphere with length of propeller shaft as radius. Eight steel pins, ⅝″ diameter, 3″ long, are riveted into the flange attached to engine shaft and work in holes reamed tapering in flange attached to wheel shaft. Wheel shaft extends into flange on engine shaft, about ¾″, thereby helping to keep wheel flange in place. The wheel shaft is hung in bearing secured by a steel plate bent around and riveted to lower end of a piece of oak 2½″ by 4½″, tapered like a wedge at lower end, curved with length of wheel shaft as radius, and sliding vertically in a similarly curved casing securely bolted to deck beams. The wheel blades, when at highest point, just clear deck, and are not submerged entirely. Engine shaft is inclined so as to bring wheel shaft in line when in ordinary use, *i. e.*, down. This pitching wheel shaft has not proved objectionable, thus corroborating the views of that party who urged the inclined shaft so strongly before one of your New York societies two or three years since. By the way, does this universal joint coupling happen to be new? I never saw it. I know it is good.

For cruising I have never seen a more comfortable rig. A party of seven last summer were out weeks with it, and were certainly very comfortable. With a mosquito net around the cabin, and when hot with the curtains down a little, the nights were delightful.

WM. B. REED.

Hastings, Minnesota, June 24, 1884.



THE STEAM CATAMARAN MAY BARRETT.

TWELVE-WHEEL FREIGHT LOCOMOTIVE.

At the Long Branch meeting of the Master Mechanics' Association, the Committee on Improvements of the Locomotive exhibited, among other things, a photograph and some sketches of an engine built by Mr. Alex. Mitchell, of the Lehigh Valley Railroad, but which by no means attracted the attention which the novelty of the design and the performance of the engine deserved.

It made its first appearance upon the track, says *The National Car-Builder*, as a ten coupled fourteen-wheeler, having a pony truck at both ends. The weight of the engine, however, was but 108,000 pounds, and experiments showed that while the design was satisfactory, so great a number of drivers was not necessary for an engine of this weight. One pair of wheels was therefore removed, and the positions of the others arranged so as to make the rigid wheel-base of the engine similar to that of an ordinary Mogul. As will be seen from the engraving, the engine now has two trucks and eight driving wheels, differing from the Consolidation in having a pony truck at each end and the first and second drivers more widely separated. Instead of a blank tire on the main or second pair of drivers, the trailing drivers are used without a flange, making the rigid wheel-base the same as that of a Mogul.

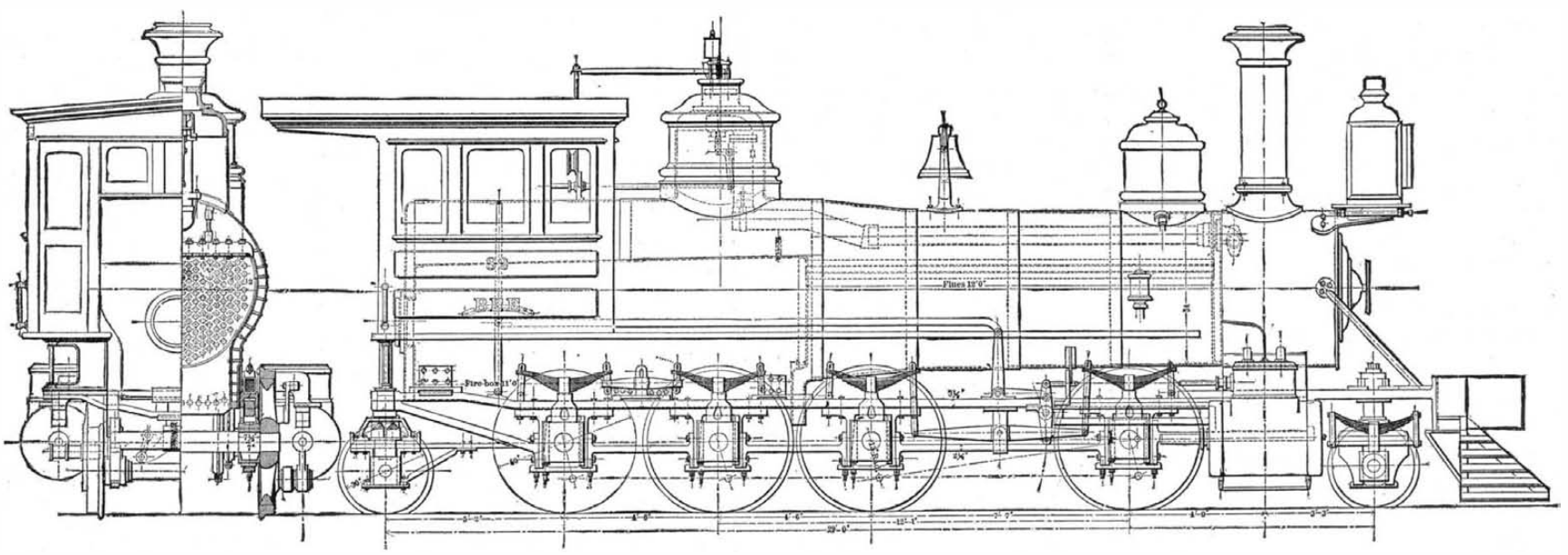
This arrangement is possible because the trailing truck guides the back end of the machine. The rigid wheel-base is but 12 feet 1 inch, the total wheel-base 29 feet, or 6 feet more than that of the Consolidation engine, while its rigid wheel-base is 3 feet shorter.

As would be expected, the engine is much easier on the curves, and at the same time runs with much less danger of getting off the rails. The forward truck is of the usual pony pattern, with half elliptic springs. The trailing truck has volutes under the side bearings and spirals in deep pockets in the center.

The frame of the engine differs from the ordinary type in having jaws and braces in separate forgings, which are bolted together. The main bar is straight to the back end, where it is slightly turned up. The first and second pair of drivers are equalized with each other, and can be equalized with the pony truck if necessary. The third and fourth pairs are also equalized together. The latter pair have seven-inch plain tires. The driving wheels are 60 inches in diameter, and have 88,000 pounds upon them, or but little more than that which is placed with safety on an ordinary car journal. The leading truck has 11,000 pounds, and the trailing truck 6,000. The cylinders are of an unusual size, at least for this part of the country, being 20 inches in diameter by 26 inch stroke. They have De Laney balanced valves, and two relief valves on the steam-chest cover. The boiler to supply steam to the cylinders is of Otis steel, is 54 inches in diameter at the smallest ring, and has 288 2-inch flues 12 feet long. It is fed by pumps driven in the usual way from the cross-head, but there is a small injector in the cab for use in case of emergencies or when the engine is standing. The fire-box is 11 feet long on the bottom and 33 inches wide inside at the grate. The Bee, as the engine is called, has gained for itself a very enviable reputation on the road, and has demonstrated that the principles involved in its construction are correct.

Nuremberg Metal Exhibition of 1885.

This international display of precious metals and alloys, organized by the Bavarian Industrial Museum, promises to be of remarkable interest. The Government has decided upon giving medals of gold and silver. Free entry will be granted to all works which are again exported, and a lottery will take place in which the prizes will consist of objects which have been exhibited. A guarantee fund of £5,000 has already been arranged, and the various German consulates in other countries will assist in the work. It is stated in the *Metallarbeiter* that Indian metal work, as well as Persian and Kabyle specimens, will be exhibited. In America, Spain, and Portugal the idea has been warmly taken up, and the participation of Japan is considered certain. France, Italy, Belgium, and Austria have been applying for space in an encouraging manner. As to Germany itself, it would seem that the old metal working towns, Hanau, Pforzheim, Stuttgart, Gmund, etc., will be represented in a special manner. The historical department will be of great interest. The light will partially be obtained from above, the objects shown being thus exhibited under favorable circumstances.



TWELVE WHEEL FREIGHT LOCOMOTIVE—LEHIGH VALLEY RAILROAD.

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The Proper Weight of Man.

Prof. Huxley gives the following table of what a full grown man should weigh, and how this weight should be divided: Weight, 154 pounds. Made up thus: Muscles and their appurtenances, 68 pounds; skeleton, 24 pounds; skin, 10½ pounds; fat, 28 pounds; brain, 3 pounds; thoracic viscera, 3½ pounds; abdominal viscera, 11 pounds; blood which would drain from body, 7 pounds. This man ought to consume per diem: Lean beefsteak, 5,000 grains; bread, 6,000 grains; milk, 7,000 grains; potatoes, 3,000 grains; butter, 600 grains; and water, 22,900 grains. His heart should beat 75 times a minute, and he should breathe 15 times a minute. In 24 hours he would vitiate 1,750 cubic feet of pure air to the extent of 1 per cent; a man, therefore, of the weight mentioned ought to have 800 cubic feet of well ventilated space. He would throw off by the skin 18 ounces of water, 300 grains of solid matter, and 400 grains of carbonic acid every 24 hours, and his total loss during the 24 hours would be 6 pounds of water and a little above 2 pounds of other matter.

In this connection we read that Dr. Schweninger, of Munich, has discovered a new mode of reducing the bulk of the human frame. It is, never to eat and drink at the same time, but to let two hours intervene. He has, it is said, cured Prince Bismarck of a tendency to obesity in this way.

Fat people have now their choice between four systems: 1. The original Banting, which consists of eating nothing containing starch, sugar, or fat. 2. The German Banting, which allows fat, but forbids sugar or starch. 3. A Munich system, which consists of being clothed in wool and sleeping in flannel blankets instead of sheets. 4. Not eating and drinking at the same time.

The New Cunard Steamship Umbria.

This new ship is expected to reach New York about Nov. 6. On her recent trial trip the vessel steamed a distance of thirty miles at a speed of twenty-one nautical miles an hour. A marked increase of speed may be looked for when her machinery is in thorough working order. The Umbria is the largest vessel afloat, with the exception of the Great Eastern. She is 520 feet long, 57 feet 3 inches breadth of beam, and 41 feet depth of hold, and measures over 8,000 tons. The vessel was built in the Fairfield yard at Govan, where a majority of the fast steamers of late years have been constructed. Her great breadth affords room for a wide saloon, which is 76 feet long, 9 feet high, and lighted by a lofty cupola skylight. The whole of the saloon is paneled with oak, slightly carved. The electric light is used. The Umbria will carry 720 first class passengers, and has no steerage accommodations. The engines of this magnificent work of marine architecture are the most powerful in the world. The center high pressure cylinder is 71 inches in diameter, and the two low pressure are each 105 inches, with a 6 foot stroke. The screw is made of manganese bronze, cast in the Fairfield yard. The qualities of manganese bronze, combined with the development in practice of the true proportions of the screw propeller, are computed to add upward of a knot an hour to the performance of the old fashioned cast iron blades. The vessel is fitted for the Admiralty service, and can carry coal for 16 days when moving continually at a speed of eighteen knots an hour.

Freezing of Seneca Lake.

A correspondent writes us, mentioning circumstances and witnesses, of the freezing over of Seneca Lake two successive years on May 5, 1860–61, with a thin sheet of ice like window glass. Appleton's Cyclopædia also mentions its having frozen over March 22, 1856, although, aside from these instances, it has never been known to freeze over even in the coldest winters.

The lake is situated in the western part of New York State, is 37 miles long and two to four miles broad, 630 feet deep, its surface about 200 feet above Lake Ontario, and 450 feet above the Atlantic.

A STATE Association of Inventors was organized in Kentucky, Sept. 17, as a branch of the National Association formed at Cincinnati last March.

THE LIVING ORGANISMS OF THE ATMOSPHERE.

As well known, the depths of the ocean were for centuries regarded as abysses inaccessible to the sight, and it was taught that no living being could exist in the darkness that reigned therein. Yet it was only necessary to cast the lead and trawl into the submarine valleys to discover therein an entire flora of wonderful richness and beauty, and an entire fauna of singular beings regarding whose form and nature there could have been no suspicion. On another hand, the microscope has revealed the existence of innumerable animalcules in the least drop of water taken from any spot whatever on the surface of the ocean, and, in the very place where it was believed that there could be nothing but inert matter, the presence of life has been discovered in its completest development.

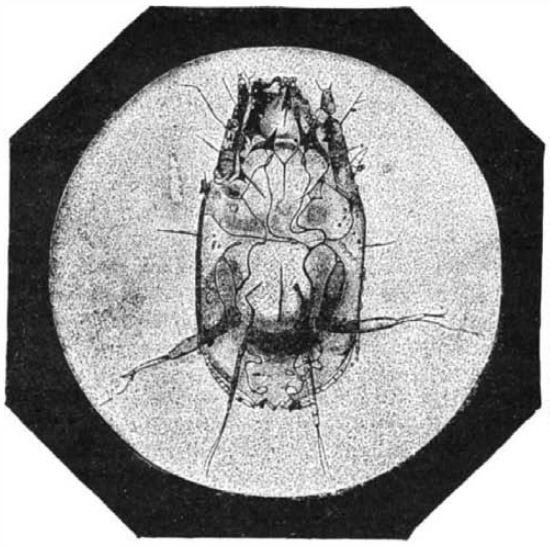

Fig. 1.—REMAINS OF AN ACARUS × 250.

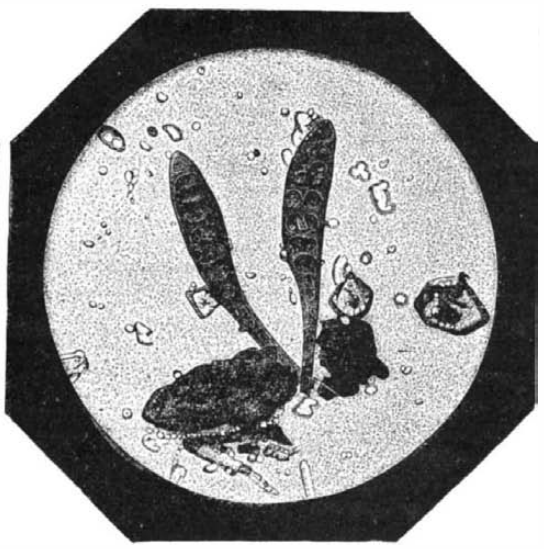

Fig. 2.—SPORES OF ALTERNARIA × 400.

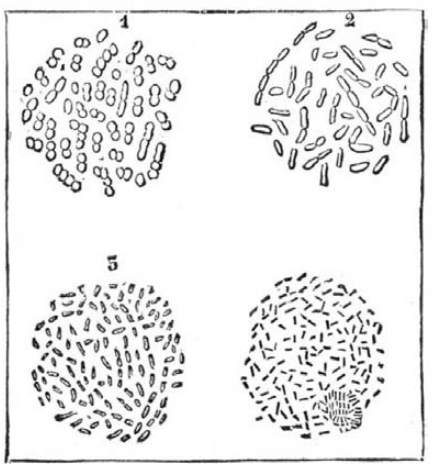

Fig. 5.—ATMOSPHERIC BACTERIA × 1000.

It is the same with the atmosphere. In that transparent, invisible, ungraspable air in which for centuries nothing has been seen but winged birds and insects, the microscope shows us to-day a whole world suspended, unbeknown to us, amid the dust that is continuously floating about. The air is no less peopled than the ocean, and, just as we see sediment, infusoria, and algæ in a drop of ocean water, just so we find in the least volume of air collected near the earth dust, vegetable debris, living organisms, and infinitely small animalcules, which live, feed, develop, and reproduce themselves, and germs of fermentation and putrefaction—those noxious organisms in which Mr. Pasteur has found the cause of so many maladies that afflict humanity.

In recent years the question of atmospheric dust has been studied by the aid of new methods, by a learned investigator, Dr. P. Miquel, chief of the micrographic service of the Montsouris Observatory. This gentleman has collected together a description of his processes and analyses, and the results that he has obtained, in a remarkable work which we shall now make known to our readers by extracting therefrom a few interesting and little known facts.

We shall not speak of the methods by means of which we may collect atmospheric dust and aerial sediments; it will suffice to say that they are usually based upon the filtration of a certain volume of air, and upon the condensation of the aqueous vapor which it contains and which carries along the dust in suspension, or else upon an examination of the sediment from rain or snow water that has been collected in special vessels.

We shall give at present a few specimens of the productions that Dr. Miquel has found in atmospheric dust during the course of his long and patient researches. Cadavers and debris of animal and vegetable nature are very frequently met with in the corpuscles of the atmosphere. Herein we find butterfly scales, down from the bodies of birds, parts of insects' bodies, and sometimes even the entire carcasses of acarians (Fig. 1). The nature of the organized corpuscles of the atmosphere is exceedingly varied, and starch grains, spores of cryptogams, and complete unicellular plants are very abundant therein. Fig. 2 shows, under a magnification of 400 diameters, two spores of *Alternaria* near a blackish mass, which is nothing else than a lichen spore that did not come within the focus. Fig. 3 represents a few very common types of aerial spores. At *b* is seen a large number of young and tender cryptogams that are very abundant after rains. Fig. 4 shows a few other specimens which Dr. Miquel collected from the air of the Montsouris Park.

Since Mr. Pasteur's great labors in this field, the study of the animalcules of the atmosphere, and of the bacteria, bacilli, and vibrios that are found in suspension therein, has offered great interest, and Dr. Miquel has succeeded in throwing much light upon it. In order to collect atmospheric bacteria, it is necessary to have recourse to delicate methods, and notably to examine under strong magnifications the liquid formed through the artificial condensation of the aqueous vapor of the atmosphere—that which, for example, stands upon the surface of an internally cooled glass vessel. For our part, we have also often met with bacteria in drops of dew that we had gathered in the country upon herbs at daybreak.

Fig. 5 shows, according to Dr. Miquel, four specimens of atmospheric bacteria. "The first," says the learned observer, "approaches the *Micrococci* in appearance and the *Bacteria* in mobility. The second might serve as a type to the species; its adult articulations, four one-thousandths to five one-thousandths of a millimeter in length, are about one one-thousandth of a millimeter in thickness; it appears to be the same thing as the *Bacterium lineolum* of Cohn. I have met with it quite frequently in the dust of hospitals. The third has the appearance of the *Bacterium catenulum* of Dujardin. The air shows several varieties of this, and one of them, which I have cultivated, has the singular property of converting one gramme of sulphur into hydrosulphuric acid in forty-eight hours in 4 liters of boiled water, to which has been added tartrate of ammonia and an excess of sulphur. The bacterium marked No. 4 is a microbe of exceedingly small size, and it is necessary to accustom the eye for a long time to the light of the microscope in order to see it detach itself as a shining or black object upon the field rendered luminous or dark. It is found quite frequently in the course of development in the matter secreted by several micrococci."

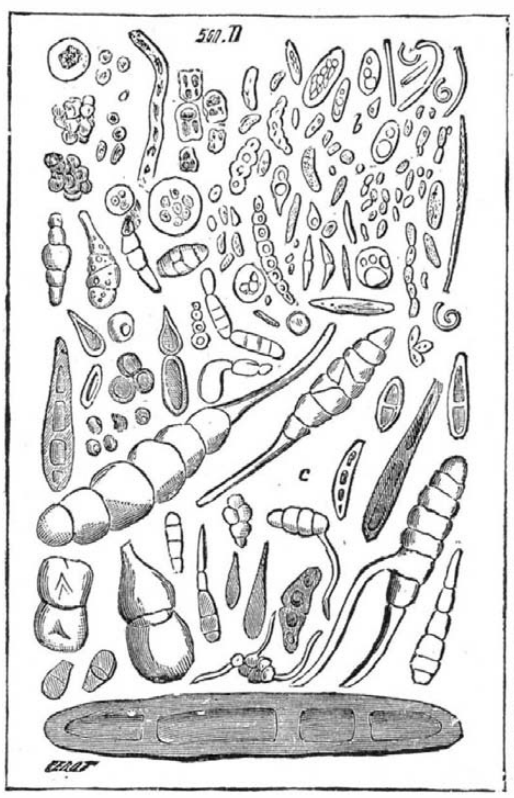

Fig. 3.—SPORES OF CRYPTOGAMS × 500.

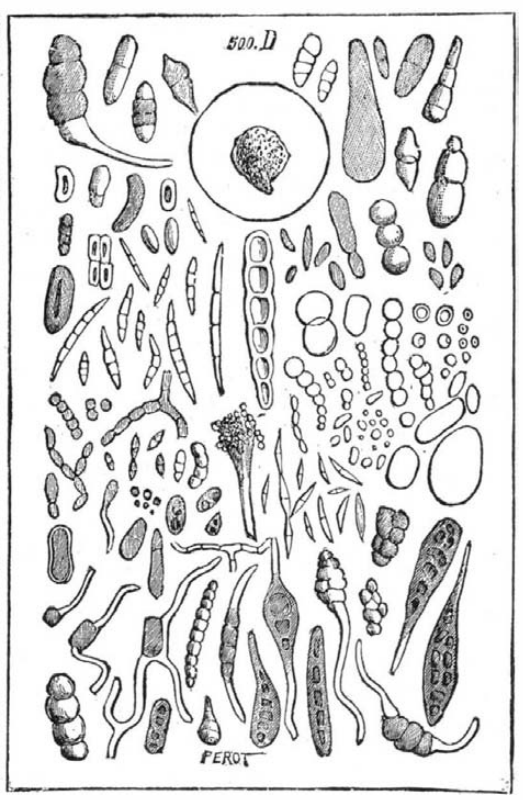

Fig. 4.—SPORES OF CRYPTOGAMS × 500.

Such are the living organisms that belong to the class of microbes whose existence and role has been revealed by Mr. Pasteur. When we consider these infinitely small objects—true dots in motion—under the microscopic objective, we cannot rid ourselves of that singular impression that Michelet, in his poetic language, has so well called "the vertigo of infinity." What would

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not one give to have at his disposal a still more powerful microscope, that would permit of seeing better, and of distinguishing the details of these beings' organization?

But *cui bono?* One would then doubtless discover still smaller ones yet which would defy science anew.—*La Nature.*

The Foresight of Insects for their Young.

In no manner is the mysterious influence of instinct over the insect world more remarkably manifested than by the care taken by parent insects for the future welfare of offspring which they are destined never to behold. As the human parent upon his deathbed makes the best provision he can for the sustenance and prosperity of his infant children, whom death has decreed that he may not in person watch over, so those insects which nature has decreed shall be always the parents of orphan children, led by an unerring influence within, do their best to provide for the wants of the coming generation.

The butterfly, after flitting through her short life, seeks out a spot whereon to deposit her numerous eggs, not—as one might expect of a creature devoid of mind—upon any chance plant, or even upon the plant or flower from which she herself has been wont to draw her sustenance, but upon the particular plant which forms the invariable food of the larvæ of her species. The various kinds of clothes moths penetrate into our cupboards, drawers, and everywhere where furs, woolen garments, etc., are stored, that they may there lay their eggs, to hatch into the burrowing grubs which are the terror of our housekeepers. The ichneumon tribe, one of nature's greatest counterpoises to keep down the too rapid increase of the insect world, lay their eggs in the larvæ of other insects, which eggs when hatched develop into a devouring brood, which ungratefully turn upon and devour the helpless creature that sheltered them as a nest. The female ichneumon, having discovered a caterpillar or grub which her instinct informs her has not been previously attacked, at once proceeds to thrust her ovipositor into the writhing body of her victim, depositing one or more eggs, according to the size of the living food supply. When hatched, the larvæ devour and live upon their foster parent, avoiding in a marvelous way the vital parts of their victim, whose life is most accurately timed to last until its young tormentors are full grown, and not beyond. At one time we were led to believe in occasional instances of the instinct of female ichneumons being at fault, by observing them apparently ovipositing upon the dry shells of pupæ from which the butterflies had escaped. This, however, we subsequently found to be an erroneous idea, the fact of the matter being, that the caterpillar upon which the parent ichneumon had laid her fatal egg had had time, before the full development of the young ichneumon grub, to turn to the pupal stage. What, then, we saw was the young ichneumon fly just emerged from the dry pupal case, the contents of which it had first devoured in its own larval stage, then, itself turning to a pupa, it had lain, thus doubly incased, until, having broken forth a perfect fly, it rested upon its late prison, awaiting sufficient strength to come to its wings. What a wooden horse of Troy such a chrysalis would prove, if introduced into the breeding establishment of a collector!

Other members of the ichneumon tribe do not actually insert their eggs into the destined food supply of their young; but, as it were, going deeper into calculation of future events, content themselves with laying them in close proximity to the eggs of some member of the tribe upon which it is their mission to prey.

There is an old saying—

> Big fleas have little fleas
> Upon their backs to bite 'em;
> Little fleas have smaller fleas,
> So on *ad infinitum*,

which is very true, inasmuch as from the great humble bee down to the tiniest corn thrips—a mere speck of dust to the naked eye—all insects have their parasites, and generally their own special species of ichneumon, to prevent their over increase and to preserve the due balance of nature. There is a species of longicorn beetle found in Pennsylvania which feeds upon the tender bark of young hickory shoots. When laying time arrives, the female, having deposited her eggs in cavities perforated in the bark, carefully cuts a groove, about one-tenth of an inch wide and deep, round the shoot just below where her treasures lie. The object, or rather we suppose we ought to say the consequence, of this act is the withering and decay of the shoot, a provision for the sustenance of her young, which, when in their larval state, live upon dead wood! This remarkable insect is called the hickory girder from the above mentioned habit, which, we think, is one of the most extraordinary instances of foresight, through a mere blind instinct, that has ever come under observation.

The gadfly (*Œstrus equi*), whose larvæ are the bots which inhabit the intestines of the horse, gains for her progeny that comfortable position by entrapping the animal itself into introducing her eggs within its stomach. For this purpose, she lays her eggs upon such portions of the horse's body as he is in the habit of frequently licking, such as the knees, shoulders, etc. The unerring nature of her instinct is shown by the fact that she never chooses as a nidus any portion of the body which the horse is unable to reach with its tongue. Having thus been introduced into their natural feeding ground, the bots there pass their larval existence until, it becoming time for them to assume the pupal form, they go forth with the animal's dung to reach the earth, burrow into it, and therein pass the insects' purgatory.

Again, one of the grain moths (*Gelechia cerealella*) shows remarkable instinct in adapting itself to circumstances according to the time of year when it has to deposit its eggs. The first generation of these moths, emerging in May from pupæ which have lain in the granaries through the winter, lay their countless eggs upon the as yet ungathered corn, upon which their young play havoc until, having passed through the necessary stages, they come out in the autumn as the second generation amid the now stored up grain. Now, however, their instinct prompts them, not, like the first generation, to go forth to the fields to seek the proper nest and future nourishment of their young, but bids them deposit their eggs upon the store of wheat ready at hand. Thus, two following generations of the same insect are led by their instincts to different habits to suit the altered and, in the last case, unnatural position of their infants' destined food supply.

The interesting mason wasp, having with great care and skill bored out a cylindrical hole in some sunny sandbank, deposits at the bottom of this refuge her eggs. Next, provident mother as she is, she seeks out about a dozen small caterpillars, always of the same species, and immures them alive in the pit, as food for her cruel children. In making her selection of grubs to be thus buried alive, she rejects any that may not have reached maturity; not, we imagine, upon the score of their not being so full flavored, but because, when not full grown, they require food to keep them alive; whereas, when of mature age, they will live a long time without nourishment, ready to turn to chrysalides when opportunity occurs.

These are but a few of the instances which might be adduced in illustration of this foresight in insects, which compensates for their not being allowed in person to superintend the welfare of their offspring. In many cases, it would be better for human progeny were their parents thus endowed with an unerring instinct, rather than with an uncertain will.—*Chambers's Journal.*

The Real Paris.

Not long ago many visitors to Paris returned home full of enthusiasm for that beautiful city, and anxious to know why London, and New York, and Philadelphia and other great towns could not be made like the French capital. Now the French themselves are criticising the municipal administration of Paris, and from the account given of it in a recent number of their leading review, our people can get some useful hints. With a population approaching two millions and a half, less than a third are natives of the city, for it is a central point for skilled workmen and men of all pursuits from far and near. It has about 80,000 houses, with over a million separate apartments, of which two-thirds are used as dwellings and one-third for business; and of the former, three-fourths rent for less than a hundred dollars a year, housing one million of its working population. While London has more than three hundred building associations, with over a hundred thousand members, Paris owes its new houses mainly to large speculative corporations, which look more to their own profit, eked out by long terms of exemption from taxation, than to the health or comfort of the working men.

Even the important matter of public conveyances is left to great companies, and with their 9,000 cabs and 1,200 omnibuses and horse cars, and 13,000 private carriages, there is still complaint of a want of cheap and convenient means of transportation to the growing suburbs. The great omnibus company, in return for an exclusive privilege lasting until 1912, and at prices fixed by law, pays to the city half a million dollars annually. The gas and water companies are also private corporations, with long terms of exclusive right to supplying the city, and they pay over five millions of dollars annually into the city treasury. Water is scarce and gas is dear, as compared with supply and prices in other European capitals, but in spite of suits brought by the city the companies hold to the letter of their contracts, and refuse to meet the growing demand for a concession in the interest of the consumer.

Paris has a police force counting over 11,000 men in its service, and the annual arrests made average 40,000, of which number 20,000 are old offenders and 3,000 are strangers. The firemen number 1,700 men, costing $400,000 a year. Over 400,600 persons receive public assistance at a cost of nearly seven millions of dollars, and 125,000 poor are registered as entitled to alms, while 22,000 beds in the hospitals supply care for the sick and wounded. There are charity "homes" for old men and women, with room for 9,000 inmates, while for children over a million of dollars were spent in fighting the dreadful mortality that cuts off the future population in its infancy. Over five millions of dollars were spent in 1883 on education for a hundred and seventy thousand children in the public schools, while seventy thousand were in private schools, supported by subscription and taught mostly by clergymen and members of different religious orders.

The income and expenditures of the city of Paris in 1883 were over fifty millions of dollars, and of its receipts nearly thirty millions were produced by the tax called "Octroi"—the "King's eighth"—levied at the gates of Paris on all provisions that enter the city, thus adding to the cost of living. The largest item of expenditure was the interest on the municipal debt, and as that grows faster than the taxable value of property, now put at four hundred millions of dollars, and the indirect sources of income, the "Octroi" and the percentages of profits paid by the gas, water, and transportation monopolies, the future, with its growing needs for sewerage and drainage and the other recognized demands of better methods of making and keeping Paris healthy, is a matter of earnest discussion.

Much attention is paid to the numerous reforms proposed in this country and elsewhere for a change in existing municipal governments. In Paris there is a council elected by universal suffrage, but its action is largely subject to revision and veto by the Prefect, who is appointed by the general government, and hence a constant conflict, one party trying to make the local authority sovereign and independent, the other seeking to reduce it to a representation of taxpayers. The decision is still to be made; but it is of immense importance for the future of Paris, and it is of interest for all cities struggling to balance receipts and expenditures, and at the same time to meet the requirements of great and growing population crowded in the principal cities of both the old world and the new.—*Philadelphia Ledger.*

A Nocturnal Balloon Ascension.

On the 7th of August, Messrs Hervé and Alluard made a balloon ascension of so remarkable a character that it merits a description. The two aeronauts started upon their trip at midnight, from the Villette gas works at Paris, in a balloon of 1,200 cubic meters capacity. The car contained accumulators of electricity, which were constructed by Mr. Aboilard, and which supplied incandescent lamps whose light, concentrated by a powerful reflector, served for illuminating the maneuvers connected with starting, and allowed the aeronauts to read the instruments and maps with which they were provided.

The balloon slowly passed over Paris, throughout its whole extent, at the altitude of sixty meters only, lighted up the towers of Notre-Dame, crossed the Pantheon, and disappeared in the south. It landed the next day at Poisly, near Villermain (Loir-et-Cher), at one o'clock in the afternoon, after remaining in the atmosphere nearly thirteen hours. The route followed by the balloon, and carefully noted, is of genuine interest. After hovering in the bright moonlight over Sceaux and Limours, the travelers at five o'clock in the morning reached Arcemont, near Rambouillet. Here a strong current carried them along over Ablis, and then to the west toward Chartres. The landing occurred near the forest of Marchenoir. The anchor, which was of improved construction, caught without any trouble, and in a few minutes the balloon, owing to its large valve, was emptied of its gas.—*La Nature.*

The Addition of Blue to Collodion.

Herr G. P. A. Garjeanne, of Amersfoort, says he has found that the addition of a blue dye to collodion considerably increased its sensitiveness. He had a remainder of collodion prepared according to the following formula:

Ether	200 parts
Alcohol	200 "
Cotton	4 "
Iodide of ammonium	2 "
Iodide of cadmium	2 "
Bromide of cadmium	1 "

And a trace nitric acid.

The collodion had become a golden yellow, and was turning red; it worked slowly and hard. He stained it with Hofmann's violet BB (an aniline color), after which the negatives became much richer, and the sensitiveness was greatly increased. He then prepared another collodion:

Ether	200 parts.
Alcohol	200 "
Cotton	4 "
Iodide of cadmium	3 "
Pulverized bromide of potassium dissolved in a few drops of water	2 "

And stained it with methyl violet. With a poor single lens and this collodion he took photographs with an exposure of five seconds in the shade, and almost instantaneously in the full sunlight. He, therefore, asks whether greater sensitiveness could not be imparted to collodio-bromide of silver by using a blue stain?—*Archiv.*

The Largest Dredger.

The largest dredging machine in the world has been finished at Portrero Point, and will be used on the Sacramento and San Joaquin swamp lands. She has been named Thor, and modeled after the best dredges now in use by De Lesseps on the Isthmus Canal, cutting out a channel and building a levee at the same time. The Thor is 100 feet long and 61 feet wide, and has 34 iron buckets, with a capacity of 1½ cubic yards each, which can be filled and emptied fourteen times per minute. All the machinery was manufactured in San Francisco, and the timber is of Oregon pine.

A Gigantic Oil Well.

On Saturday, Oct. 11, the Christie Brothers' drilling well at Phillips City, Butler Co., Pa., struck the oil-bearing sand and began to flow at a tremendous rate, gushing forth the crude petroleum at the rate of 5,000 barrels per day, and the well will go down in history as being one of the largest wells ever struck in the oil region. The well is still producing at the rate of 180 barrels per hour. This well of Christie Brothers is only 365 feet from the famous Phillips well, which was struck Aug. 30, and is yet producing 2,200 barrels per day. These great wells have paralyzed the oil trade, and the oil market has sagged from 75 cents to 62 cents per barrel.

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The Art of Prolonging Life

The possibility of prolonging human life has undoubtedly, from the most ancient times, afforded a fascinating and extensive field alike for the visionary and the deepest thinkers. Plans for prolonging existence have ever been among the principal allurements held forth by empirics and impostors; and by thus imposing upon the credulity of the public, many notorious charlatans have acquired rich harvests of ill-gotten gold. Men of science have throughout all ages devoted their attention to the subject, as one deserving of the most profound investigation. And their researches have been attended with more or less benefit to posterity. We find that Bacon himself attached so much importance to the matter that he prosecuted inquiry in that direction with the utmost assiduity. Although it would be almost impossible to review all the schemes advanced, yet a review of the most notable theories advocated for prolongation of life is certainly deserving of attention. At the same time, an elucidation of their fallacies, as occasion may arise, is of no small moment, in order to ascertain with greater certainty their true value. It is indeed interesting to observe the various and often opposite means advocated by enthusiasts for attaining the same end.

Even as far back as the Egyptian, Greek, and Roman periods, we find the idea of prolonging life prevalent. The Egyptians bestowed considerable attention to the attainment of longevity, and they believed that life could be prolonged through the efficacy of sudorifics and emetics continually used. Instead of saying, "How do you do?" as an ordinary salutation, they inquired of each other, "How do you perspire?" In those days, it was a general custom to take at least two emetics during each month. Hippocrates and his disciples recommended moderation in diet, friction, and well timed exercise, which was certainly a step in the right direction.

It was during the darkness of the middle ages, ripe with fanaticism and superstition, that the most absurd ideas of witchcraft, horoscopes, chiromancy, and empirical panaceas for the prolongation of life first became disseminated. The philosopher's stone and elixir of life were then vaunted by the alchemists. Foremost among the prolongers of life we find Paracelsus, an alchemist of great renown, and a man of considerable attainments. He claimed to have discovered the elixir of life. So great was his influence, that even the learned Erasmus did not disdain to consult him. Patients and pupils flocked around him from every quarter of Europe. Notwithstanding his famous "stone of immortality," he died at the age of fifty. His vaunted elixir was a kind of sulphur similar to compound sulphuric ether. Nevertheless, to the researches of Paracelsus we are indebted for our primary knowlege of mercury, which he was the first to use as a medicine.

About this epoch, one Leonard Thurneysser attained worldwide celebrity as an astrologer and nativity caster. He was a physician, printer, bookseller, and horoscopist all in one. He professed that, by the aid of astrology, he could not only predict future events, but likewise prolong life. He published yearly an astrological calendar, describing the nature of the forthcoming year and its chief events. His calendar and other quackeries enabled him to amass the sum of one thousand florins. He declared that every man lay under the influence of a certain star, by which his destiny was ruled. On ascertaining from what planet a person's misfortunes or sickness proceeded, he advised his patient to remove his residence within the control of a more propitious luminary. In short, to escape from the influence of a malignant to a more friendly satellite was the basis of his theory.

Marsilius Ficinus, in his *Treatise on the Prolongation of Life*, recommended all prudent persons to consult an astrologer every seven years, thereby to avoid any danger which might threaten them. During the year 1470, an individual named Pansa dedicated to the Council of Leipzig a book entitled *The Prolongation of Life*, in which he most strongly urges all persons desirous of longevity to be on their guard every seven years, because Saturn, a hostile planet, ruled at these periods. According to the teachings of astrology, metals were believed to be in intimate connection with the planets. Thus no doubt it was that amulets and talismans originated, as reputed agents for prolonging life. The disciples of this creed had amulets and talismans cast of the proper metal, and under the influence of certain constellations, in order to protect themselves from the evil influence of adverse planets. These absurd conceits were at a later period revived by Cagliostro, of whom we shall have more to say presently. It would indeed appear that the more mysterious and ridiculous the conceptions of fanatics and impostors were, the greater was their success.

The example of the renowned Cornaro affords a brilliant instance of the superiority of an abstemious life to the foolish doctrines put forth at that period. Up to forty years of age he was excessively intemperate both in eating and drinking, so that his health suffered considerably. He then resolved to submit himself to a strictly temperate regimen, and for the remaining sixty years of his life, which almost reached one hundred years, he continued the observance of his rules, with the result given. Although life might be prolonged by exercising greater moderation in eating and drinking than is generally adopted, yet, nevertheless, few persons could safely follow so strict a dietary.

Shortly after the death of Louis XIII. of France, who was bled forty-seven times during the last ten months of existence, a contrary method came into fashion. Transfusion was for a time relied upon as a means for invigorating and prolonging life. The operation was performed by aid of a small pipe conveying blood from the artery of one person to another. In Paris, Drs. Dennis and Riva were enabled to cure a young man who had previously been treated in vain for lethargy. Further experiments not being so satisfactory, this device as a prolonger of life became discarded.

Francis Bacon held somewhat unique ideas regarding the possible prolongation of existence. He regarded life as a flame continually being consumed by the surrounding atmosphere, and he thence concluded that, by retarding vital waste and renewing the bodily powers from time to time, life might be lengthened. With the object of preventing undue external vital waste, he advised cold bathing, followed by friction. Tranquillity of mind, cooling food, with the use of opiates, he advocated as the most suitable measures for lessening internal consumption. Furthermore, he proposed to renovate life periodically, first by a spare diet combined with cathartics, subsequently through choice of a refreshing and succulent diet. With some degree of modification, there seems to be much wisdom in his views, excepting as regards the opiates, which are decidedly of a prejudicial nature.

Numerous charlatans have appeared, and still appear at intervals, loud in their asseverations of having discovered the veritable elixir of life—gold, tinctures, and many other nostrums with which they mendaciously promise to prolong life. The most notorious of these empirics was the Count de St. Germain, who with barefaced effrontery protested that he had already existed for centuries by aid of his "Tea of Long Life," which he declared would rejuvenate mankind. On close examination, his miraculous philter was ascertained to consist of a simple infusion of sandal wood, fennel, and senna leaves.

A great stir was created in 1785, by the occult pretensions of a fanatical physician in France named Mesmer. He vaunted the possession of extraordinary magnetic power, which enabled him forthwith, by its agency, to remove every disease and prolong life. At the king's desire, a commission was instituted to report upon this phenomenon, in which Dr. Franklin took a leading part. The only practical result of this inquiry was the discovery of animal electricity. At one time, Mesmer refused three hundred and forty thousand livres for his secret. After Dr. Franklin's investigations, Mesmer lapsed into obscurity.

Last, but not least in the foremost rank of impostors, was Joseph Balsamo, alias Count de Cagliostro. This charlatan appeared just before the first French Revolution. During his remarkable career, Cagliostro made more than one fortune, which he subsequently lost, and died in prison in 1795. The distinguished Cardinal de Rohan was one of his chief dupes. Like St. Germain, Balsamo boasted that he had discovered the elixir of life, and throughout Europe found persons of all degrees eager to possess his panacea. This elixir was a very powerful stomachic, possessed of great stimulating properties, tending to augment vital sensations. It is a fixed law of nature that everything which increases the vital forces tends to abridge their duration. Concentrated and potent stimulants, which are usually the active principle of most elixirs, although for the time increasing strength, are in truth very prejudicial to longevity.

We will now pass on to examine other theories more worthy of attention, before we proceed to establish what at present appears to be the most certain means for promoting longevity. The plan of "hardening"—based upon a false supposition that by toughening the physical organs they would wear longer—obtained at one time numerous followers. When we reflect that the main principle of life depends upon the pliability of every organ, combined with free circulation, it naturally follows that rigidity must be unfriendly to longevity. Perpetual cold baths, exposure to keen air, and exhausting exercise were advocated by the "hardening school." Like most enthusiasts, they carried their ideas to excess, a limited use of which would have been beneficial. Later on, a theory well suited to the idle and luxurious gained many adherents, namely, to retard bodily waste by a trance-like sleep. One enthusiast, Maupertuis, went so far as to propound the possibility of completely suspending vital activity. Even Dr. Franklin, having observed the restoration of apparently dead flies by exposure to warmth, was struck with the feasibility of promoting long life by the agency of immobility. The misconception of this theory, from a physiological point of view, is at once self-evident, as want of exercise is simply poisonous to health. Upon a constant metamorphosis of the tissues, physical well-being must depend to a great extent. A destructive plethora would most certainly be induced by attempting "vital suspension."

That celebrated sect of mystical philosophers, the Rosicrucians—famous for their profound acquaintance with natural phenomena and the higher branches of physical, chemical, and medical science—considered that human existence might be protracted far beyond its supposed limits. They professed to retard old age by means of certain medicaments, whose action upon the system should curb the progress of natural decay. The means by which they professed to check senile decrepitude were, like other mysteries of their fraternity, never revealed. The celebrated English Rosicrucian Dr. Fludd, whose writings became famous, is said to have lived a century.

The principal disadvantage of the various plans which have been set forth for promoting longevity appears to be that they are all deficient in this important respect—that they only regard *one object and neglect the rest.* However beneficial any theory may prove, it must be materially inadequate in fulfilling its purpose, should numerous other matters of the greatest importance bearing upon the human economy be ignored. Hufeland, in his luminous work, "The Art of Prolonging Life," is of opinion that the real art of longevity consists in cultivating those agents which protract existence, and by avoiding all circumstances tending to shorten its duration. This is undoubtedly the most reasonable method for obtaining the end in view. Moderation in all things (avoiding as far as possible every morbific condition), and open air exercise, are far more reliable means of prolonging life than any of the elixirs and panaceas ever advocated. Finally, health and longevity can only be attained by an intimate acquaintance with and obedience to those natural laws which govern our physical economy.—*Chambers's Journal.*

Cause and Prevention of Forest Fires.

This is the season for forest fires, and in many parts of the country we hear of great destruction already from burnt fields and forests. The New Bedford *Evening Standard* in an article on the subject concludes that the most frequent cause for such fires is from careless tourists and sportsmen, who on leaving a camp, to make sure that the fire is put out, will kick the embers about, thinking that by thus separating the half burnt brands the fire will soon go out. So they will, perhaps, nine times out of ten; but the tenth time a whirling gust of wind may carry a spark or coal where it will kindle a blaze, or one of the brands may have some soft, punky place in it where the fire will nestle for days, and bide its time. But old backwoodsmen, the writer thinks, are not so apt to take things for granted.

In northern Maine and New Hampshire, he said, tourists would throw away cigar stumps. The backwoodsmen can't afford cigars, and as a rule smoke their pipes out, because they don't find tobacco or the money to pay for it very abundant.

Before breech loaders or cut wads became so common, many bad fires were started from gun wads made of loose paper. The cut wads now used do not hold fire long. Of course, with metal cartridges there is no danger.

Locomotive sparks are a very frequent cause when a railroad runs through a large forest. In planning preventive legislation, it might be well to inquire whether railroads running through such regions should not be required during certain months of the year to keep a section force larger than mere track repair would require. Either this or carrying spark arresters on every locomotive seems to be demanded by the public welfare.

Few people realize how serious a calamity these fires have become. Already in the most thickly settled parts of the country good working wood is becoming scarce and high, although there is often a glut of inferior grades, and therefore very low prices for them. The correspondents of the lumber journals report from almost all quarters that the demand for really good material is generally in excess of the supply. The only hope for the future lies in economy of what we have, and in whatever will encourage those owning young timber to keep it and prune it and thin it out so as to bring it on to fill up the gap. But forest fires destroy an amazing amount of the precious mature stock—how much no one knows—but it is said by experts that the amount destroyed probably equals the amount cut. Now, we know that the sawed stuff (to say nothing of fuel and charcoal, ties, telegraph, and hop poles, etc.) reaches an annual value of over $230,000,000 at the mills, so that, counting other forest products besides sawed stuff thus destroyed, it is, no doubt, within reason to say this waste, largely needless, is not less than $300,000,000 a year. But this is not all, and very likely it is not the worst. Such fires burn up a great amount of young growth and of seed, and in some cases even the soil itself is roasted to death, so that for a long time afterward it will not bear anything of value.

Cure for Sciatica.

A remedial agency not commonly resorted to has been recently brought under notice by M. Debove for the relief of neuralgic sciatica. This physician seems to have met with considerable success in the treatment of sciatica by freezing the skin. Richardson's ether spray not proving satisfactory, M. Debove employed the chloride of methyl, which may give rise to a degree of cold represented by —23° C. This agent has the advantage of not being expensive. A jet of the fluid is made to play on the skin along the whole length of the limb corresponding to the course of the sciatic nerve and its main branches. The good effects are said to be instantaneous. The operation is also claimed to be but little painful; the smarting is not so great as that caused by the hot iron. Vesication has followed the employment of this remedy, but never any sloughing. The extension of this measure to other neuralgiæ is advocated.—*Lancet.*

The Quickest Time between Philadelphia and Jersey City.

Mr. Wm. Barnet Le Van informs us that the quickest time ever made between Philadelphia and Jersey City was made by locomotive "5000," the five thousandth built by the Baldwin Locomotive Works, on May 14, 1880, over the Bound Brook route.

Distance	89·4 miles.
Time	98 minutes.

The weight of the train complete was 148 tons. The return trip was made in 100 minutes.

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The Efficiency of a Boiler.

BY DR. H. A. MOTT.

As the amount of water converted into steam, required per horse power for high pressure engines and low pressure condensing engines differs materially, as also differs with the particular make of engine, it is best, to avoid confusion in results, to estimate the efficiency of a boiler by the actual amount of water evaporated by one pound of the combustible portion of the coal from and at 212° F. into steam free from entrained water.

Again, to theoretically deduce the greatest amount of water which can be evaporated by one pound of coal, it is best to figure on the basis of pure carbon, as all coal contains a variable amount of ash, and in ordinary boilers forms a varying amount of clinkers, and also all coal contains small percentages of other elements which increase more or less their efficiency.

Adopting, then, pure carbon as a basis for figuring, then any result may be modified according to the composition of the fuel used in any particular experiment.

It is true that certain standards have been adopted from time to time to represent a horse power, as for example, Nystrom states that the evaporation of 39,607 pounds of water per hour from 32° F. to 70 pounds pressure is equal to one horse power.

While Mr. Emery, probably the highest authority on steam engineering in this country, fixed at the last Centennial Exhibition the following as a standard: The evaporation of 30 pounds of water from a temperature of the feed 100° F. to 70 pounds pressure equals one horse power; others have substituted 212° for 100° F. Some of the best engines take very much less water to the horse power, while some inferior engines require twice the amount.

If the amount of water which can be evaporated from and at 212° F. from one pound of combustible matter is known, then any formula which is correct for any particular engine can be adopted to ascertain the horse power.

While the amount necessary to produce a horse power varies with the engine employed, still a horse power is a fixed amount of work, and is the amount of energy required to lift 33,000 pounds through one foot in one minute, or 1,980,000 pounds through one foot in one hour.

How much horse power, then, can theoretically be obtained from one pound of pure carbon?

The complete combustion of one pound of carbon generates sufficient energy to lift 10,808,000 pounds one foot in one minute.

Therefore, if 10,808,000 is divided by 33,000, the result—327·5—will represent the horse power generated in one minute; and if this result be divided by 60 (minutes), the result will be 5·44 horse power, which represents the total theoretical horse power generated by the combustion of one pound of carbon for one hour. The 10,808,000 foot pounds is obtained by multiplying the heat units of carbon, which are 14,500, by the mechanical equivalent of heat—772 foot pounds.

While one pound of carbon by its complete combustion can generate (theoretically) 5·44 horse power for one hour, it is unfortunate that no engine has yet been devised to practically utilize the heat of combustion *directly*, and not through some other agent, as water or bisulphide of carbon. When water is used as a medium to convey the heat, a boiler has to be employed.

Under this condition, if all the heat of the combustion of one pound of carbon were communicated to the water, and none lost, then one pound of carbon would theoretically convert 15 pounds of water at 212° F. into steam of 212° F. This is deduced by dividing the total heat units of coal—14,500—by 966, the number of heat units rendered latent when one pound of water passes into steam.

If, then, one pound of carbon will convert 15 pounds of water at 212° into steam at 212° F., then it will convert 12·2 pounds of water from a temperature of 100° F. into steam of 70 pounds pressure. Using Emery's formula for a horse power, then one pound of carbon will theoretically produce 0·465 horse power, or 2·46 pounds will produce one horse power.

Such a result, however, never could be obtained practically, for no allowance is made for loss of heat by imperfect combustion, radiation, and the heat necessary to escape up a chimney to produce a chimney draught, etc.

As a result of thirty tests conducted by Mr. Emery at the Centennial, the highest result obtained from the combustible matter in anthracite coal was the production of one horse power with 2·85 pounds of coal combustible, or from 3·18 pounds of coal, the poorest result obtained was the production of one horse power with 4·10 pounds of combustible matter, or 4·44 pounds of coal. In the first instance the evaporation per pound of combustible from and at 212° was 12,094 pounds of water, or 10·52 pounds from 100° to 70 pounds pressure; in the second, the result was 8·397 pounds and 7·304 pounds.

The first result shows a utilization of over 86 per cent of the combustible matter, assuming it to be about the same as pure carbon. An actual test made at Lynn, Mass., showed that at the pumping works the boilers only returned 66 per cent of the fuel as steam, and only 10 per cent (in round numbers) of the total energy of the fuel was contributed to the working force of the engine. *The great loss, then, of the heat units in coal is not so much in the boiler as in the engine*, as a first class boiler will *not lose over* 15 *per cent* of the theoretical amount. While there is a chance for some improvement in boilers, it is insignificant compared to the improvement which should be made in steam engines. Considerable improvement has been made in the latter, as, for example, a first class slide valve engine requires 45 pounds of water per horse power, while a Harris-Corliss engine only requires 25 pounds of water, and in the Harris-Corliss condensing engine, according to actual test, one horse power is produced with 1·8328 pounds combustible (Wilmington coal), and with the utilization of 16·156 pounds of water per indicated horse power (actual) at a temperature of feed 114·34° to 92·876 pounds pressure, the boilers evaporating 9·639 pounds of water from and at 212° F. by one pound of coal, or 10·31 pounds of water per pound of combustible.

To estimate the efficiency of a boiler, the engine must be left out of consideration, as the quantity of water required per horse power has been shown to be variable, and depending on the kind and make of the same.

The amount of water converted into steam from 212° to 212° F. is the most reliable means of determining the efficiency of a boiler; then all boilers can be compared on the same basis. If the standard for a horse power fixed by Emery be adopted, then all boilers can be compared on this basis, which will give the correct result for engines conforming with the standard, but which result must be altered to conform with engines requiring different standards.

The question was asked me, Can 700 horse power be produced *for ten hours* from *two tons* of *coal*, and if not, what is the greatest theoretical amount of horse power that can be obtained for ten hours from the same quantity of coal? Assuming the coal to be pure carbon, then two tons, or 4,000 pounds, in ten hours would be 400 pounds per hour. The theoretical evaporation given above for pure carbon was 12·2 pounds of water from 100° F. to 70 pounds pressure. Adopting Emery's standard for a horse power, then 400 pounds of coal (pure carbon) would theoretically produce 162·66 horse power per hour, and with two tons the same horse power for ten hours, or 700 horse power *for only 2 hours and 19 minutes+*, instead of for *ten hours*. The least theoretical amount of coal (pure carbon) that would produce 700 horse power for ten hours would be 8·6 tons. Of course such an economical result could never be obtained practically. As all coal contains inorganic salts (ashes), heat is lost by radiation, and heat of necessity is lost with the escaping gases up the chimney. If 700 horse power should be practically produced from ten tons of coal, the result would be excellent.

Delays in the Patent Office.

We are in receipt of complaints from inventors and manufacturers of machinery because of the delay to which they are subjected in obtaining patent papers from the Patent Office in Washington. As a rule, an inventor cannot receive the adjustment of his claim in less than eight or nine months, and often the period is much further prolonged. One of the results of this is that serious injury is inflicted upon persons who desire to patent articles which are of temporary utility, and which cannot be marketed to advantage unless they can be offered for sale at once. The number of such articles for which patents are desired is by no means small, and the failure of the Government to grant patents promptly simply has the effect to rob the inventions of the whole of their value. These are the extreme cases. Not so much harm is done by delay in the cases of inventions which are of permanent usefulness; but even in these there are vexation, annoyance, and loss, for which no reasonable excuse can be offered, and to which no inventor should be subjected. The policy of our Government, based upon wise considerations, has always been to encourage invention by dealing liberally with inventors; and to this policy we may attribute much of the huge industrial advancement which has characterized the first century of our national existence. Any creation of obstacles to profitable invention would be a most grievous blunder, but the harassing delay now involved in the practice of the Patent Office is an obstacle of a very serious character.

There can be no difficulty in discovering the reason for this procrastination. The Patent Office simply has more work to do than can be done properly by its present clerical force. The number of applications now made every day is about 125. This is about twice the quantity that was offered a few years ago; but, while the population and the inventive effort of the country have largely increased, the force in the Patent Office remains as it was a score of years since. The Commissioner has attempted to bring some relief to applicants by taking up, out of their regular order, the inventions which seemed to him to be of most pressing importance; but this, of course, has worked injustice to the mass of applicants, and it has now been formally abandoned. The Commissioner declares that he can make no expedition of procedure until Congress shall give him more money and more men; and so the blame for the whole difficulty comes back to Congress, and the remedy can be applied only by Congress.

It is always a hard thing to impress upon the average Representative the importance of reforming anything in which he is not directly interested as touching the needs of a large mass of his constituents. The ordinary Congressman is either a lawyer or a professional politician, and, as he has no interest in machinery, he is apt to regard inventors and inventions with nearly complete indifference. At the end of a session, he will vote to cut down every appropriation which he thinks does not concern him, so that he can increase every appropriation which will help him in his district. The way to enforce the attention of Congress to the needs of the Patent Office, and of the machinery builders, is for every man in the country who is in any way interested in machinery to write to his Representative, stating the case and demanding redress. The appeals of the Commissioner of Patents have been made in strong terms, and they have uniformly been disregarded; the average Congressman cares nothing for demands from that quarter. What is required is the active interposition of the voters in the districts. The fees demanded of patentees are large enough to secure good and prompt service from the Patent Office, and such service is not only the right of individual inventors, but of the nation which profits so much from their ingenuity.—*Textile Record.*

Insurance Risks in Inebriety.

The well-known fact that life insurance companies find excessive mortality in their risks in certain sections of the South and Southwest has been the subject of some interest lately. Several of the Hartford companies who have examined the facts have found that this mortality came directly from inebriety, and was due to the liberal interpretation of the agents, who did not realize that any risk of inebriety was perilous unless the insured had suffered from delirium tremens many times. No use of alcohol, either moderate or occasionally immoderate, was thought to be dangerous.

The agents and examiners had no clear conception of the danger of alcohol, and treated the companies' views as extreme. The result was that special examiners were sent from the home office to cancel all the risks of ten thousand and upward where the insured were found using alcohol to any excess. Finally some of the companies withdrew their agents altogether, and do not solicit business in certain sections. In one case twenty-eight deaths were all traced to the excessive use of alcohol, and were all paid, simply because it was cheaper to settle than to contest. At a recent meeting of the Tennessee State Board of Health, the Secretary reported that a Hartford life insurance company had ordered its agents not to issue any policies in six counties of the State, owing to the excessive mortality of the policyholders. The question came up of the cause of this mortality; as no reports indicated any special disease in this section, a letter was addressed to the secretary of the company to know the reason.

The answer was that from the amount of insured lives in these counties, the average loss to the company should be about sixty-eight thousand dollars, when in fact it was over one hundred and fifty thousand dollars—more than double the loss of any other section, and that without any special cause of epidemic disease.

The real explanation was the want of care in taking risks and the number of inebriates who had been taken as proper cases. It is the same old blunder of supposing inebriety to be a mere vice at the control of the victim, and in no way periling life unless used to great extremes.—*Jour. of Inebriety.*

Electric Light at Hell Gate.

On Monday evening, October 20, the electric lights in the new lighthouse at Hell Gate were turned on for the first time, and the result was very satisfactory. Every outline of the shore could be distinctly seen, and the water sparkled as the light jumped and flashed from wave to wave in the rapid current. Hereafter the fleet of vessels which come down the river each morning in the dark will be able to pass the most dangerous parts of Hell Gate without waiting, as heretofore, for the sun to rise and light up the rocks that make the passage so perilous. The tower consists of four iron columns placed so as to form a pyramid cut off at the top. The columns are 54 feet apart at the base and 5 feet apart at the extreme top. The columns are joined together by iron work, and each is anchored at the base to a block of concrete 9 feet square at the bottom and 10 feet high. The electricity is supplied to the lamps by a No. 8 Brush machine, running nine lamps of 6,000 candles each—a total of 54,000 candles. The lamps are arranged to form three-quarters of a circle.

All the electric machinery in the tower is to be duplicated, so in case of accident the light would not fail. In the SCIENTIFIC AMERICAN of March 24 was published a full description of this new lighthouse, with drawings and diagrams illustrating its construction.

Domestic Pond Lilies.

At the New York State Experiment Station there is a barrel cut down to convenient size, and then set in a hole dug in the earth upon a corner of the lawn. The top of the barrel is just level with the surface of the lawn. It has about four inches of river mud in the bottom, in which were planted a few roots of the common white pond lily. The barrel was then filled with water, and is kept full from a faucet in the aqueduct pipe, the water being turned on as often as necessary. The barrel has been a beautiful miniature pond of white lilies all through the season. In the fall, after the weather gets cold, the barrel or tub is lifted out and carried to the cellar, where it is protected from freezing, and where the roots of the lilies will be kept in conditions similar to what they would be surrounded with in their natural state. Nothing can be more charming in the way of flowers on a lawn than a small pond of water lilies blooming daily the whole summer through. Of course the barrel must be set where teams and persons would not walk into it by night or day. If the tub is a tight one, the trouble of keeping it supplied with water will not be great upon any lawn.—*N. E. Farmer.*

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ENGINEERING INVENTIONS.

A pump has been patented by Mr. Edward G. Shortt, of Carthage, N. Y. It is especially designed for use in connection with a direct-acting steam engine whose piston is on the same rod with the pump plunger, the pump being combined with the steam engine as a complete direct-acting pumping engine.

AGRICULTURAL INVENTIONS.

A harrow has been patented by Mr. Nels Johnson, of Fairfield, Bureau County, Ill. There is a stretcher for coupling two or more harrows, the coupling devices being simple, so the harrows can be readily connected or disconnected, with other novel features of construction and arrangement.

A check rower has been patented by Mr. John Hussung, of Shelby City, Ky. This invention relates to corn planters drawn over the field by a team to drop in one or more rows at a time, and provides means so the distances between the hills may be regulated, and a mark made on the ground opposite the hill to indicate its location.

MISCELLANEOUS INVENTIONS.

An irrigating dam has been patented by Mr. Jacob S. Flory, of Hygiene, Col. This invention provides a diaphragm or plate-like dam, of diminishing area in a downward direction, and with a gate in its upper portion, and is intended to supersede former rough and imperfect expedients for controlling water in irrigating ditches.

A method of and apparatus for heating and ventilating buildings has been patented by Mr. Ira J. Ordway, of Chicago, Ill. This invention provides a complete and independent heating apparatus for each room, with inlet and outlet registers within easy reach of the occupant, securing a continuous circulation of reheated air or separately heated fresh air, or both, as desired.

A sliding gate has been patented by Mr. George W. E. Hart, of Modesto, Ill. It is intended mainly for a yard gate, and is to be constructed of palings, wire, or iron, made either as a single or double gate, closing at the middle, is well balanced, works easily, and not liable to get out of order.

A windmill has been patented by Mr. Joshua G. Benster, of Duncan, Neb. This invention covers improvements in the construction and arrangement of the supporting apparatus, of the frame, and also of the wheel and transmitting apparatus, and the ...ratus for mounting and operating the tail vane, to make a simple and substantial windmill.

A worm fence has been patented by Mr. William R. True, of Rocheport, Mo. The rails and posts are held together by a wire and bound in a special manner, whereby the rails are supported in such a way as to give great strength, and the fence is simple of construction.

A draught mechanism for vehicles has been patented by Mr. George H. Chappell, of Huron, Dakota Ter. It is an improved contrivance of lever mechanism, adapted to multiply the force of the drawing power when first taking effect on the vehicle.

A fire extinguisher for railroad cars has been patented by Messrs. James Hocking and Clement R. Jones, of Denton, Neb. This invention relates to devices for discharging a tank of water or other fire extinguisher into a railroad car stove in case of collision or other serious accident to a passenger train.

A shot gun has been patented by Mr. Frank C. Dimitt, of Rocheport, Mo. This invention relates to shot guns with barrels hinged to tip down so as to raise the breech, and has special features intended to make such gun simple, strong, and durable, inexpensive to manufacture, and without intricate parts.

A newspaper file stick has been patented by Mr. John F. Huth, of Norwalk, Ohio. It consists of a grooved rod or bar, a binding blade, a permanent and a removable ferrule, with a snap spring, so combined as to securely hold papers and documents, and with a cover if desired.

A store service system has been patented by Mr. George H. Spring, of Lemars, Iowa. This invention relates to a cash carrier on a suspended horizontal wire, providing new and better means for propelling the carrier, improved detachments for detaining the carriers, improvements on the track wire, with certain devices and mechanical arrangements for the convenience of the cashier's office.

A shot gun attachment for magazine rifles has been patented by Mr. Horace Warner, of Wilcox, Pa. Above the rifle barrel is a shot barrel, with its own special breech block, extractor, and firing pin, with various details of construction to adapt the gun conveniently for alternate use as a shot gun or rifle.

Beam compasses, or an improved trammel and calipers, form the subject of a patent issued to Mr. Emory Patch, of Janesville, Wis. Two blocks of metal are drilled to receive two rods, one end of each being bent to form the trammel points, the opposite end of the rod being pointed to form the caliper points, the rods being so connected that either may be easily moved, and then rigidly clamped.

NEW BOOKS AND PUBLICATIONS.

DYNAMO-ELECTRICITY; ITS GENERATION, APPLICATION, TRANSMISSION, STORAGE, AND MEASUREMENT. By George B. Prescott. D. Appleton & Co., New York.

Of the many books which have appeared on this subject recently, this one of Mr. Prescott is probably the most complete. In its nearly 900 pages will be found descriptions of many machines and devices now quite out of date, but they yet have a certain value as indicating the line of investigation and experiment by which the public has obtained its present knowledge of electrical manipulations; while all the more recent advances in the whole field seem to have received full attention. The relative efficiency of different kinds of dynamos, and methods of utilizing the currents they generate, the systems in use in Europe as well as here, the regulators and means of measuring the current, and the different electric railways, are described with a detail which seems almost superfluous, except that the subject is one in which so many investigators are interested that even somewhat of iteration is perhaps excusable. Mr. Prescott is a veteran investigator in the field of electrical development, and was a contributor of articles on this subject for the SCIENTIFIC AMERICAN many years ago, when its present importance was only anticipated by a few then generally classed as enthusiasts.

LEISURE HOURS AMONG THE GEMS. By Augustus C. Hamlin. James R. Osgood & Co., Boston.

This book treats more particularly of the diamond, the emerald, the opal, and the sapphire. It mentions with a good deal of detail the principal gems in the world, with critical remarks thereon and on their cutting, and is withal a most interesting volume, presenting a good deal of new matter in a most entertaining style.

LEFFEL'S HOUSE PLANS. James Leffel & Co., New York. Price, $2.

This is a book for people of limited means desiring to build their own homes. It contains elevations, plans, and descriptions of forty different houses, costing from $500 to $3,000 each, and each with sufficient detail to enable an intelligent mechanic to choose understandingly the kind of house he desires within the limits stated.

Received.

FORMATION OF POISONS BY MICRO-ORGANISMS. A Biological Study of the Germ Theory of Disease. By G. V. Black. P. Blakiston, Son & Co., Philadelphia.

THE FALLACIES IN "PROGRESS AND POVERTY." By William Hanson. Fowler & Wells Co., New York.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

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If a ninvention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent agency, 361 Broadway, New York.

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We are sole manufacturers of the Fibrous Asbestos Removable Pipe and Boiler Coverings. We make pure asbestos goods of all kinds. The Chalmers-Spence Co., 419 East 8th Street, New York.

Clark's Rubber Wheels. See adv. next issue.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Emerson's 1884 Book of Saws. New matter. 75,000. Free. Emerson, Smith & Co., Limited, Beaver Falls, Pa.

Hoisting Engines, Friction Clutch Pulleys, Cut-off Couplings. D. Frisbie & Co., Philadelphia, Pa.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 270.

Munson's Improved Portable Mills, Utica, N. Y.

Machine for grooving chilled rolls for flour mills. Pratt & Whitney Co., Hartford, Conn.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 141.

Catechism of the Locomotive. 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N. Y.

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Popularity of the Type Writer.

Special Dispatch to THE TIMES (Philadelphia).

WASHINGTON, October 5.—Forty feminine manipulators of type-writing machines have been recently examined by the Civil Service Commission, and they have just received notice of the grade to which their proficiency entitles them. It was the first examination of the kind, and was altogether a curious exhibition. The exercises were read sentence by sentence by the examiner, and at each pause the fingers of forty women and girls would fly with almost lightning speed over forty machines. Some who were accustomed to write shorthand from dictation would catch the words while writing, and finish the sentence nearly as soon as the examiner. This act of the Civil Service Commission is suggestive of the rapidity with which the type writer is superseding all other forms of copying. Chiefs of divisions in the various departments are allowed clerks who have been usually stenographers. Now these are being supplanted on every hand by the type-writer, and by the combined stenographer and type-writer.

The Remington Type-writer is the one used by the United States Government. Wyckoff, Seamans & Benedict, 281 and 283 Broadway, New York City, are the sole agents.

Notes & Queries

HINTS TO CORRESPONDENTS.

Name and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or mail, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter**, should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) J. E. N. asks the processes of making chromate or bichromate of soda and acetate of chromium, using bichromate of potash. A. The manufacture of bichromate of soda is identical with that of the potash salt, except that soda salts are used in its preparation. The process consists of the treatment of powdered chrome ore mixed with soda, lime, and a solution of sodium carbonate in a reverberatory furnace, and there digesting with a hot saturated solution of sodium sulphate in lixiviating tanks. This yields the simple chromate; then by the action of sulphuric acid the bichromate is obtained. The chromic acetate is obtained by dissolving chromic hydrate in acetic acid. We do not understand that it is made directly from the bichromate.

(2) C. W. C. writes: In reference to the purification of water by a "solution of iron," I would like to know what would be the best solution of iron for that purpose. Whether an oxide or simple compound or a salt. A. Iron chloride is probably the best solution to use, but there is very little difference between the action of the various solutions of the iron salts.

(3) W. F. B. asks what degree of heat in a cupola is required to melt scrap malleable iron. Is the percentage of loss in remelting greater or less in scrap malleable than in cast iron? A. There is no foundry practice with which we are acquainted that furnishes data for a categorical answer. Malleable scrap is used only in small quantities with other scrap for pouring sash weights and similar articles.

(4) E. W. writes: 1. In your issue of July 28, 1884, No. 28, page 27, in the recipe for Lee & Perrin's sauce, you say "Chutney 1½ ounces." Is this correct? A. The amount of chutney (1½ oz.) given in the original recipe is correct. Chutney is a preparation made in the East, consisting of several ingredients, and an essence of chutney does not exist to our knowledge. 2. Some months ago I noticed something about an instrument by means of which light pictures of any size can be thrown upon a screen at the pleasure of the artist, and there painted or penciled. Please give me the name of the instrument, where obtained, and the price. A. A New York dealer has an instrument called photo-optican. It costs $35, and is probably what you refer to.

(5) C. T. B. writes: I recently put some copperas into the water standing in the porcelain bowl (white) of my water closet for disinfecting purposes, and in a few minutes poured into the solution some spirits of ammonia, and directly there appeared an irregular dark blue band around the bowl at and near the surface of the standing water. I have since tried to remove this discoloration by applications of oxalic acid, sulphuric acid, and nitromuriatic acid, but without success. What can I use to remove the discoloration? A. It is impossible to understand how the coloration came to exist, but we presume it is due to the action of the ammonia on copper. We would recommend you to try the use of the caustic alkalies, either caustic potash or caustic soda. If they are not effective in the cold, try them hot.

(6) W. P. A. asks if salt water is commonly used in the boilers of small steam launches on salt river, or, if not, what provision is generally made for a water supply? Also, the approximate amount of coal and water consumed per hour on a two horse power boiler. A. Small steam launches usually have tanks for fresh water storage sufficient for from ¾ to 1 cubic foot per horse power per hour, or about 10 cubic feet for a day's excursion of constant run, requiring about 100 to 125 pounds coal, making about 700 pounds load for fuel and water.

(7) C. W. W. writes: Please name the alkalies prevailing in the alkali, lands of the West, and the diseases likely to follow the continued use of the waters therefrom. A. The alkali lands of the West consist principally of soda, both as carbonate and bicarbonate. Lime salts and other salts of soda are present in smaller amounts. It would be difficult to say that any special disease follows the continual use of the water, but it has been surmised that the mountain fever which is taken by the emigrants as they cross the plains results from the use of the water.

(8) D. D. L.—We do not believe any remedies you can try for the cure of corns will be of much avail unless you wear large and comfortable foot coverings. A New York city judge who came to the United States when a young man, once declared that he never had any corns till he came to this country, because he never had any shoes to wear before.

(9) E. E. W. writes: Please give me a recipe for a good polish for pianos and organs, something that will be cheap to make and that will be lasting, and something that will bring out the grain of the wood. A. A fine lustrous polish for delicate cabinet work can be made as follows: Half a pint linseed oil, half pint of old ale, the white of an egg, one ounce spirits of wine, one ounce spirits of salts. Shake well before using. A little to be applied to face of a soft linen pad, and lightly rubbed for a minute over the article to be polished.

(10) J. H. D. writes: Can you make any suggestion as to how we may utilize tin scraps? A. Tin scrap is utilized in the vicinity of New York by the chemical works, who treat it with boiling nitric acid, producing products for dyeing and other purposes. A little is used occasionally by iron founders to toughen cast iron. It has no commercial value.

(11) W. E. McA. asks about heating a roller rink by steam. Rink is 187 feet by 86 feet, and 13 feet high. What should be size of boiler, and size and number of turns of pipe? A. You will require 4,000 linear feet of 1 inch pipe in coils, around the sides of the rink, for heating, and a 15 horse power boiler.

(12) E. T. Q. writes: In your reply to C. M., in your issue for September 27, you say that a bullet thrown vertically upward would fall back to the point of starting, in a vacuum. In this you forget the revolution of the earth, which would be a disturbing element, and would cause the projectile to fall west of the starting point. A. The bullet as well as the gun, partakes of the motion of the earth.

(13) J. H. R. writes: I wished to increase the pressure on our pump to a point higher than our relief valve could be loaded to. An acquaintance suggested putting on a heavier weight, using the pressure gauge as a guide, ignoring the numbers already on the valve. I claimed that that would be wrong, inasmuch as spring gauges are liable to err, and furthermore the numbers on the lever ought to indicate the pressure at which the valve would relieve itself. Please decide which was right. A. Overloading the lever of a safety valve on a boiler is all wrong; but overloading a relief valve upon a pump for a requirement indicated by a gauge is proper and admissible.

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October 14, 1884,

AND EACH BEARING THAT DATE.

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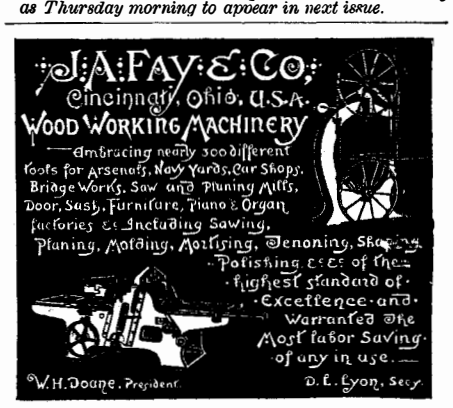
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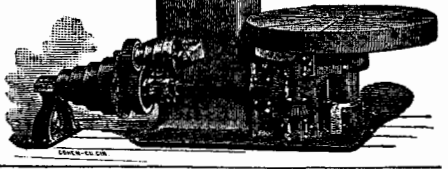

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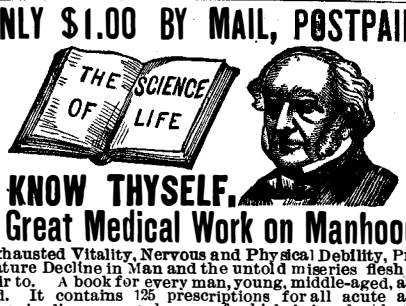

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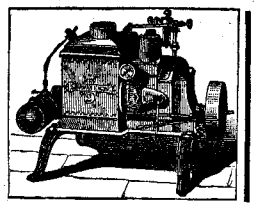

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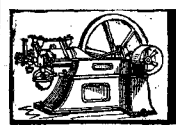

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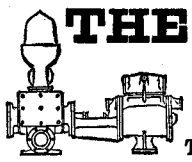

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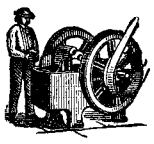

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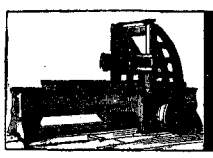

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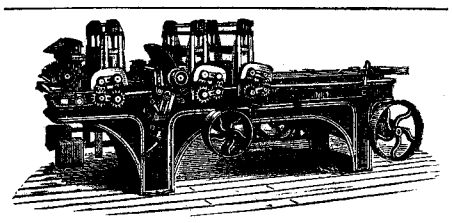

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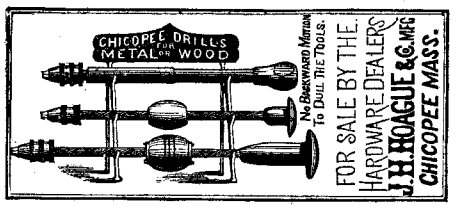
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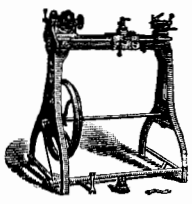

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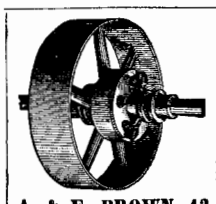

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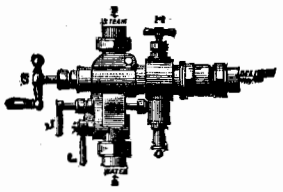

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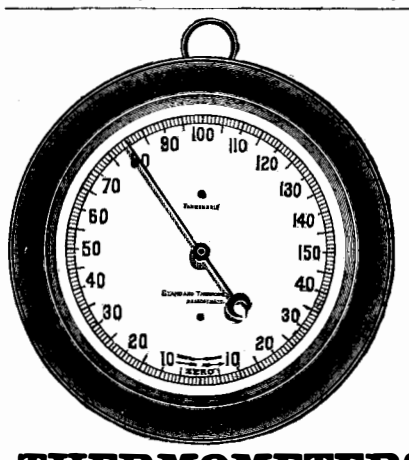

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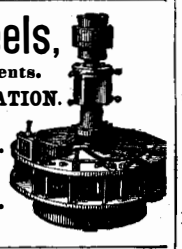

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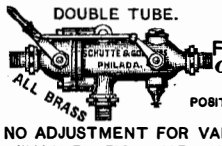

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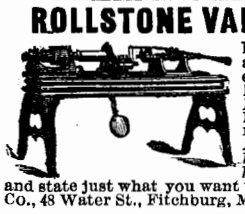

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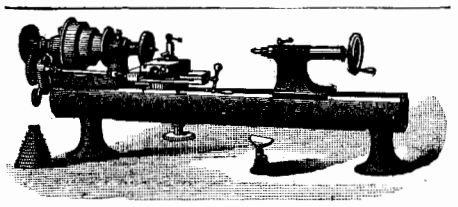

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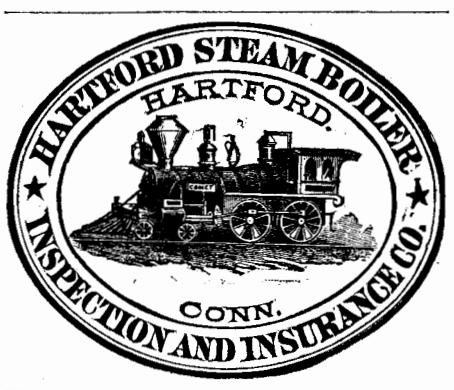

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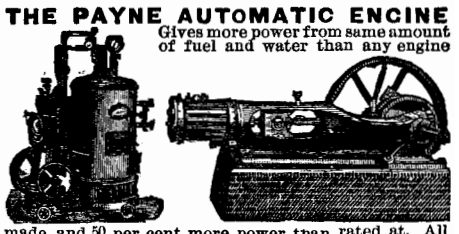

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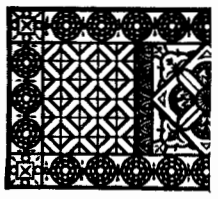

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